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Twenty-Ninth Annual Convention 227

Observations on Palatopharyngeal Movements in Speech and Deglutition
HARLAN BLOOMER 230

The Objective Measurement of Progressive Esophageal Speech Development
JOSEPH M. WEPMAN, JOHN A. MacGAHAN, JOSEPH C. RICKARD and NEIL W. SHELTON 247

The Adaptation Effect in Stuttering Speech Behavior and Normal Speech Behavior
H. B. STARBUCK and M. D. STEER 252

A Utilization of Adaptation Phenomena in Therapy for Stuttering
GEORGE H. SHAMES 256

A Picture-Type Speech Sound Discrimination Test
WILBERT PRONOVOST and CHARLES DUMBLETON 258

An Exploration of Group Homogeneity in Group Speech Therapy
GEORGE H. SHAMES 267

The Response of Profoundly Deaf Children to Auditory Training
CLARENCE V. HUDGINS 273

Vowel Recognition as a Function of Duration, Frequency Modulation and Phonetic Context
WILLIAM R. TIFFANY 289

Letter to the Editor 302

Book Reviews, 304 Abstracts, 313

News and Announcements, 316

Notices to Members, 319

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NOTICE TO AUTHORS

Before submitting manuscripts for publication authors should consult Information for Contributors to the Journal of Speech and Hearing Disorders, *JSHD*, 14, 1949, 93-94. Prospective authors are invited to write the Editor for copies of this Note, and of its supplement, Examples of Manuscript Form.

TWENTY-NINTH ANNUAL CONVENTION

November 23-25, Hotel New Yorker, New York City

AMERICAN SPEECH AND HEARING ASSOCIATION

THE PROGRAM COMMITTEE has arranged a three-day program of sessions covering the areas of speech science, audiology and speech pathology and correction. The attention of members is called particularly to Sections 10 and 17 in the program outline which follows. Section 10, *Professional Problems*, will provide members with an opportunity to meet informally in small groups with others having similar interests and problems. Section 17, *Interrogation of 'Experts,'* is a continuation of a program feature inaugurated at the 1952 convention and will afford members an opportunity to ask questions and discuss problems personally with individuals who have recognized competence in the various areas of specialization.

Paul D. Holtzman is in charge of local arrangements.

PROGRAM OUTLINE

Sunday, November 22

All day	Registration, exhibits, Executive Council meeting
7:00 to 12:00 p.m.	National Executive Council of Sigma Alpha Eta

Monday, November 23

8:45 to 10:20 a.m.	Section 1. Evaluation of modern research in stuttering. Chairman, Charlotte G. Wells Speaker, Stanley Ainsworth
	Section 2. Seminar on clinical problems in auditory testing. Chairman, Raymond T. Carhart
	Section 3. Experimental phonetics. Chairman, John V. Irwin
10:30 to 12:00 a.m.	Section 4. Voice and articulation disorders. Chairman, Calvin W. Pettit
	Section 5. Speech therapy in cerebral palsy. Chairman, Frederic L. Darley
	Section 6. Time compression of speech. Chairman, Gordon E. Peterson Speaker, Grant Fairbanks
12:30 to 2:15 p.m.	Alumni luncheons
1:00 to 4:00 p.m.	Film Theatre. Chairman for all sessions, Oliver Bloodstein
2:30 to 4:00 p.m.	Section 7. Evaluating the results of speech therapy. Chairman, Jack Matthews
	Section 8. Problems in audiologic handling of adults. Chairman, Aram Glorig
	Section 9. Systematic research in experimental phonetics. Chairman, Mack D. Steer

4:10 to 5:30 p.m. Section 10. *Professional problems.*
Group 1. Directors of speech correction in cities of 200,000 and over.
Chairman, Dorothy G. Kester
Group 2. Speech correctionists in communities under 200,000.
Chairman, Marian Donewald
Group 3. Directors of state or county speech and hearing programs.
Chairman, Elizabeth C. MacLearie
Group 4. Private practice in speech and hearing.
Chairman, Paul D. Knight
Group 5. Hospital and rehabilitation agency speech and hearing services.
Chairman, Jack L. Bangs
Group 6. Directors of speech science laboratories.
Chairman, John W. Black
Group 7. Directors of university speech clinics.
Chairman, Harlan Bloomer
Group 8. Supervisors of student practicum training.
Chairman, Elsie M. Edwards
Group 9. Speech and hearing therapists in federal government rehabilitation programs.
Chairman, Merle Ansberry

5:30 to 6:30 p.m. Council Reception

8:00 to 8:40 p.m. Presidential Address, S. Richard Silverman
Chairman, Margaret Hall Powers

8:45 to 10:15 p.m. Business meeting of the Association

Tuesday, November 24

8:45 to 10:20 a.m. Section 11. Psychological factors in speech disorders and therapy.
Chairman, James F. Bender
Section 12. Studies of side-tone.
Chairman, T. D. Hanley

10:30 to 12:00 a.m. Section 13. The training of public school speech correctionists.
Chairman, Dorothy G. Kester
Section 14. Evaluation of modern research in audiology.
Chairman, Glenn J. Taylor
Speaker, William G. Hardy

1:00 to 5:00 p.m. Film Theatre

2:30 to 4:00 p.m. Section 15. Language and speech development.
Chairman, Letitia E. Raubicheck
Section 16. Evaluation of modern research in experimental phonetics.
Chairman, E. Thayer Curry

4:10 to 5:30 p.m. Section 17. *Interrogation of 'Experts'*
Group 1. Stuttering, Wendell Johnson
Group 2. Functional articulation problems, Katherine F. Thorn
Group 3. Voice problems, John V. Irwin
Group 4. Aphasia in adults, Jon Eisenson
Group 5. Language disabilities in children, Charles Van Riper
Group 6. Cleft palate, Eugene T. McDonald
Group 7. Cerebral palsy, Martin F. Palmer
Group 8. Hard of hearing, Raymond T. Carhart
Group 9. Services for crippled children, George G. Deaver
Group 10. Public school speech correction, Hildred A. Gross
Group 11. State and rural speech correction programs, Gretchen M. Phair
Group 12. Research technique and design, James F. Curtis
Group 13. Clinical and research instrumentation, John W. Black

7:00 to 12:00 p.m. Sigma Alpha Eta general assembly meeting

8:00 to 9:30 p.m. Film Theatre

8:00 to 11:00 p.m. Council meeting

Wednesday, November 25

8:00 to 9:00 a.m. National Executive Council of Sigma Alpha Eta

8:45 to 10:20 a.m. Section 18. Diagnostic and therapeutic techniques.
Chairman, Duane C. Spriestersbach
Section 19. The school health program and hearing conservation.
Chairman, Richard E. Marcus

10:30 to 12:00 a.m. Section 20. Organic speech disorders.
Chairman, William G. Peacher
Section 21. Methods and goals in audiologic work with young children.
Chairman, Jacqueline Keaster
Section 22. Failures in therapy—case presentations.
Chairman, Robert W. West
Film Theatre

2:00 to 3:30 p.m. Business meeting
Section 23. Practical speech correction techniques and display of materials.
Chairman, Freda W. Neugebauer

3:40 to 5:00 p.m. Section 24. Experiments in utilizing classroom teachers in the public school speech correction program.
Chairman, Zelda H. Kosh
Executive Council meeting

EDUCATION LIBRARY

Observations On Palatopharyngeal Movements In Speech And Deglutition

Harlan Bloomer

AN UNDERSTANDING of the muscular dynamics of the palatopharyngeal valve as it acts during speech, deglutition and related functions is of considerable value to the anatomist, the oral surgeon, the prosthodontist and the speech pathologist. Although progress made during the past few years in the improvement of speech and deglutition in patients with impaired palatopharyngeal tissues is encouraging, there remain many failures or partial failures which reflect the inadequate comprehension of many specialists regarding means by which valvular function can be achieved.

This report presents observations which will add information to the existing concepts of the palatopharyngeal movements during the performance of various physiological activities. Some interpretation of these observations will be made as they pertain to the muscle movements presumed to be responsible for palatopharyngeal closure.

Harlan Bloomer (Ph.D., Michigan, 1935) is Professor of Speech and Director of the Speech Clinic, University of Michigan. Preparation of the films was supervised by the author, the late Dr. John W. Kemper, Professor of Dentistry and Head of the Department of Oral Surgery, and Dr. Reed O. Dingman, Associate Professor of Dentistry, University of Michigan. The silent films were photographed by Charles R. Burd, Medical Photographer of the University of Michigan Hospital. The sound movies were made by the Jam Handy Company, Detroit. A reel of sound films, 'Velopharyngeal Action in Speech and Deglutition,' is now available for rental or purchase through the Audio-Visual Education Center, University of Michigan, Ann Arbor, Michigan.

The Palatopharyngeal Valve

In a normal person the main function of this muscular valve in speech and deglutition is to occlude or constrict the passageway between the oropharynx and nasopharynx. In deglutition the palatopharyngeal mechanism acts with the tongue to apply mechanical pressure in directing a bolus of food down the alimentary canal, and it assists in creating the negative pressures needed for ingesting liquids. In speech its action modifies voice quality (through its effects on resonance) and assists in controlling the pressure and direction of flow of the air used in speech. It contributes to the normal physiology of the ear through its control of the ostium of the Eustachian tube. It acts as a valve for pneumatic control in blowing or whistling. The uvula, in a highly specialized capacity, serves as an articulator in the production of the uvular [r] and in a less euphonious way as a vibrating flap in snoring, snorting, or nasal blowing.

The functional anatomy of the palatopharyngeal region has been de-

scribed by several observers on the basis of direct observation of living subjects, roentgenographic studies and anatomical dissections. The more detailed reports and those derived from intensive study of the region suggests a complex patterning of interaction between the vertically, obliquely and horizontally directed muscular fibers of the palate, nasopharynx and oropharynx. There are important points of disagreement, however, and many aspects of palatopharyngeal action are incompletely described.

In contrast to these detailed reports are the pathetically simple and quite inaccurate representations of palatal action which are illustrated in many textbooks and to which Koepp-Baker (5) directed critical attention in 1936. Such drawings usually depict a sagittal view of a cranial section showing a rather limp, flap-like mechanism effecting separation of the oral and nasal cavities by contacting a forward-bulging pharyngeal wall. Although a sagittal view projected by x-rays can at best give only a simplified representation of palatal positions or action, a more accurate representation than those usually provided is shown in Figure 1, based on lateral x-ray head studies. The lateral configuration of the palate and posterior pharyngeal wall appear to be consistent with the character of the activities revealed by study of the two subjects discussed in this paper.

With respect to x-ray portrayals of palatopharyngeal action, it is worth noting that many observers appear to forget that the x-rays create only a summation shadow of tissue masses. In other words, three dimensions are compressed to two dimensions, with consequent loss of significant detail. The laminographic technique of roentgenography offers some correction for this refractive error, but even in this instance, as well as in all other x-ray representations of soft tissue configurations, the shadow measurements must be interpreted with great caution.

Misinformation regarding palatopharyngeal action would, of course, be of little more than academic interest except for the fact that surgeons, dental prosthetists and speech therapists act in their various specialties according to the concepts which they hold concerning the ways in which this important valve functions. Undoubtedly misconceptions of muscular action have led to the desire of some surgeons to create *length* of palate without sufficient attention to *movement* and have led some prosthodontists to imitate the anatomical contours of the palate, whereas these specialists should concentrate on the

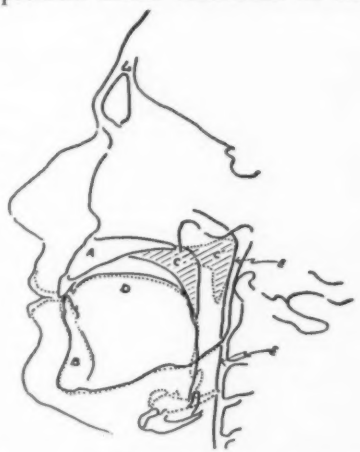


FIGURE 1. Outline tracings (superimposed) from two lateral x-ray films of a male subject, comparing the shadows of the soft palate at rest for nasal breathing (———) and in contraction for enunciation of the consonant [s] (.....). A, Hard palate; B, Mandible; C, Soft palate at rest; C', Soft palate retracted for [s]; D, Tongue; E, Posterior pharyngeal surface.

FIGURE 2. Subject 1.

adaptation of surgery and appliances to the potential actions of the palatopharyngeal tissues.

The muscle groups concerned in accomplishing palatopharyngeal closure include the muscles *tensor veli palatini*, *levator veli palatini*, *constrictor pharyngeus superior*, *salpingopharyngeus* and *pharyngopalatinus*. The uvular muscle is generally conceded to be of little significance in effecting closure.

It would require much space to abstract for presentation here the available information on the functional anatomy of the palatal region. The reader is directed for such information to standard references of anatomy and, more particularly, to the reports of Dorrance (*1*, *2*), Harrington (*3*, *4*), McMyn (*6*), Oldfield (*7*), and Wardill and Whillis (*9*). A worthwhile comprehensive summary of most of these articles and others has been prepared by Webster (*10*). Many of these published reports contain useful diagrams and drawings, reports of anatomical dissections and critical analyses of muscle action which should be carefully studied by anyone hoping to achieve an interpretation of palatopharyngeal function during speech, deglutition and related activities.

Observations of Palatopharyngeal Movement

The observations upon which this report is based were made mainly from two patients whose surgically created facial defects made possible direct visualization of most of the mucosal surfaces overlying the structures of the nasopharynx. The nature of these facial defects is shown in the sketches of Subject 1 and Subject 2 in Figures 2 and 3. Subject 1 has a particularly mobile palatopharyngeal structure which was studied in many different types of activity. Subject 2 has an extensive facial defect which although permitting the performance of a smaller number of activities than Subject 1, was of special interest because the oral and nasal surfaces of

FIGURE 3. Subject 2.

the palate could be viewed simultaneously and the movements of the tongue for speech and deglutition could be viewed in relationship to the synchronous movements of the palatopharynx.

Line tracings of the anatomical landmarks which can be identified through the facial aperture in Subject 1 are indicated in Figure 4, which shows the nasopharyngeal tissues at a point of partial elevation during swallowing. The nasal septum has been removed surgically, but otherwise the area has not been altered by surgery or disease.

Figure 5 shows the identifying landmarks in the line tracing of Subject 2. The left orbit, the anterior two-thirds of the maxillary arch, upper lip, and most of the nasal structures including parts of the right inferior and medial nasal conchae have been removed surgically in a long series of operations, and the exposed surfaces on the left have been replaced by grafted skin. This tracing was made with the palatopharynx in a state of closure during swallowing. The dash line indicates the dorsal outline of the tongue.

FIGURE 5. Subject 2, showing structures identified during act of swallowing. A, Remaining posterior third of the maxillary arch; B, Lower lip; C, Nasal surface of hard palate; D, Remainder of concha nasalis inferior; E, Remainder of concha nasalis media; F, Right torus tubarius; G, Levator cushion; H, Nasal surface of soft palate; I, Posterior surface of pharynx; J, Sphenoid rostrum; K, Upper surface of tongue shown by dash line; L, Uvula.

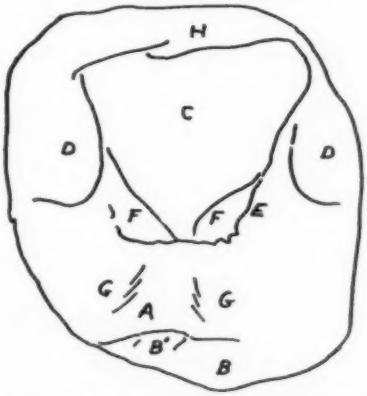


FIGURE 4. Subject 1. Structures shown during swallowing. A, Nasal surface of soft palate; B, Nasal surface of hard palate; B', Remainder of nasal septum, surgically removed; C, Posterior surface of pharynx; D, Torus tubarius; E, Left levator cushion; F, Salpingopharyngeal folds; G, Surface depressions from contraction of M. tensor veli palatini; H, Sphenoid rostrum.

Approximately 1600 feet of sound and silent movies of the two patients were used for study and tracing, supplemented by direct observations of these two subjects and one other of whom only short movie records exist. Analyses of palatopharyngeal movements were made during speech, swallowing, blowing, whistling, yawning, and snoring. The tracings represent comparative changes in tissue configuration as shown in successive frames of the movies, and the tracings are numbered according to frames, thus indicating something of the relationship between timing and extent of tissue displacement.

Swallowing. Swallowing activities were observed in both patients. Subject 1 was able to eat and to drink normally from a cup or suck water through a drinking straw. Subject 2 was able to eat soft foods and to drink if water was placed on the tongue or on the nasal surface of the palate by cannula. Line tracings of successive boundary changes are shown for both patients. In Subject 2, the elevation of the tongue is indicated by dotted lines and Roman numerals.

Drinking from a cup. Patient 1. Analysis of Figure 6, showing line tracings of Subject 1 while drinking from a cup, reveals the following 'stages' of swallowing arbitrarily selected to portray positional changes toward constriction or relaxation:

1. Frames 1-4 show a slow rise of the nasal surface of the palate and a commensurate medial displacement of (presumably) the mucosal covering of the levator muscles. The levator cushion did not enter the field of vision until the 4th frame.

2. Frames 5-8 show the nasal surface of the palate being depressed while the lateral borders of the nasopharyngeal isthmus continue to approximate medially.

3. Frames 9-13 indicate a rapid rise of the palate and an extensive narrowing of the lateral borders which now begin to show evidence of two 'borders' (frames 10, 11), one apparently attributable to levator contraction and the other representing the medial displacement of the mucosal surfaces overlying the salpingopharyngeal muscles.

It is of interest that in these and subsequent projections the points and

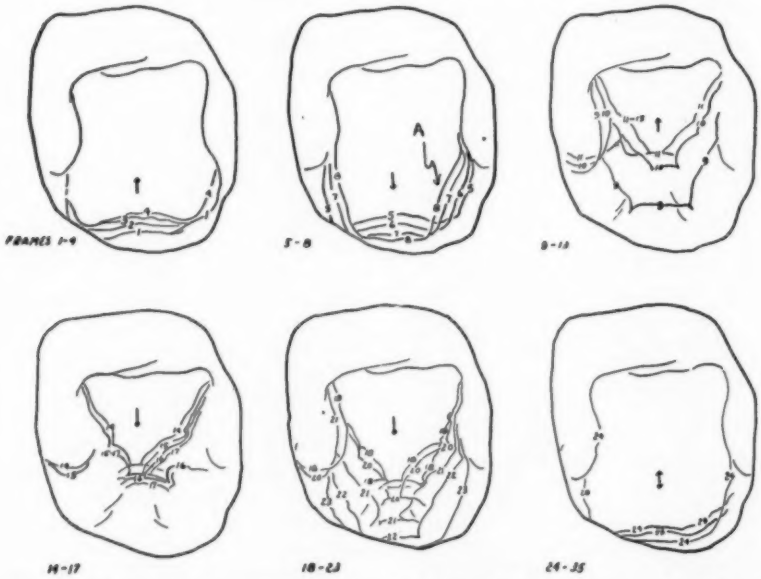


FIGURE 6. Outlines of nasopharyngeal borders of Subject 1 during process of swallowing water drunk from a cup. Arrows indicate direction of palatal movement. A, Levator cushion.

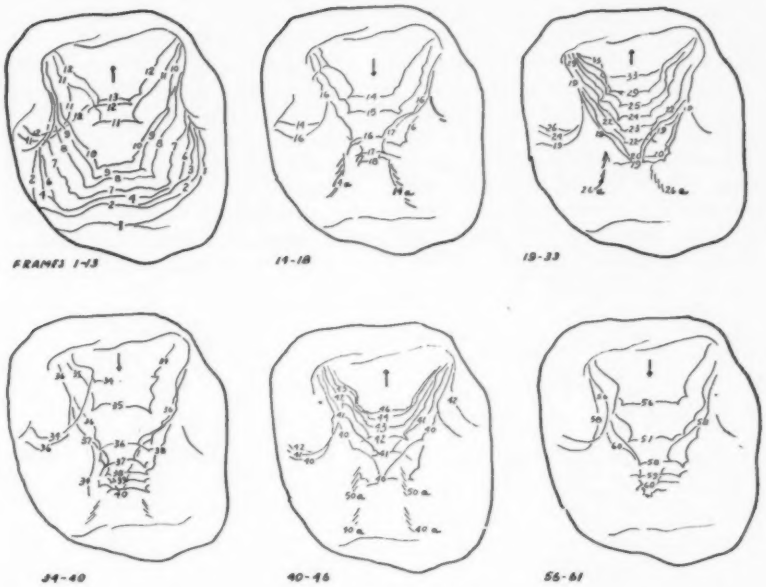


FIGURE 7. Outline of nasopharyngeal borders of Subject 1, sucking and swallowing water through a drinking straw. Arrows indicate direction of palatal movement.

the angles at which the levators appear to join the palate are relatively constant at maximum elevation or at the depression of the palate prior to complete relaxation. This would appear to indicate that at least for this subject the levator muscles do behave as a 'sling' [as described by Oldfield (7) and others], but that their contribution to palatal elevation is dependent upon the simultaneous action of the other muscle groups.

4. Frames 14-17 and 18-23 show rapid depression of the nasal surface of the palate accompanied by close approximation of the salpingopharyngeal folds throughout until frames 21 and 22 when lateral relaxation begins to appear. The visual indication of a fold of mucosa due to contraction of the levator muscles continues.

5. Frames 24-35 show the final stage in which the nasal surface of the palate finally reaches a state of rest and the lateral borders (the salpingopharyngeal folds) are no longer visible.

It can be noted that in the entire series of photographic observations the salpingopharyngeal folds were not visible in the movies of this patient except during the process of sucking or swallowing.

Drinking from a straw. Patient 1. The tracings shown in Figure 7 were made from movies of Subject 1 during the process of sucking and swallowing water from a drinking straw. It can be seen that the patterning of movements resembles closely those shown in the preceding figure, with the medial approximation of the salpingopharyngeal folds continuing even though the nasal border of the palatopharyngeal

isthmus has dropped to a relatively low level. Attention is called to the 'tensor depressions' indicated at either side of the uvular muscles in frames 14a through 50a. (Refer to G of Figure 4.) The sphincter-like contraction of the palatopharynx appears to be greater and the palatal elevation higher than in the preceding figure, probably indicating that greater suction is needed in drinking from a straw than from a cup. The beginning and ending stages of swallowing are not shown in this sequence.

It should be noted in both the foregoing series and in subsequent ones that the torus tubarius is consistently displaced medially and backward as the other tissues move toward closure of the valve. This displacement may be attributable to action of fibers of the palatopharyngeus and the salpingopharyngeus directed toward the median raphe of the pharynx.

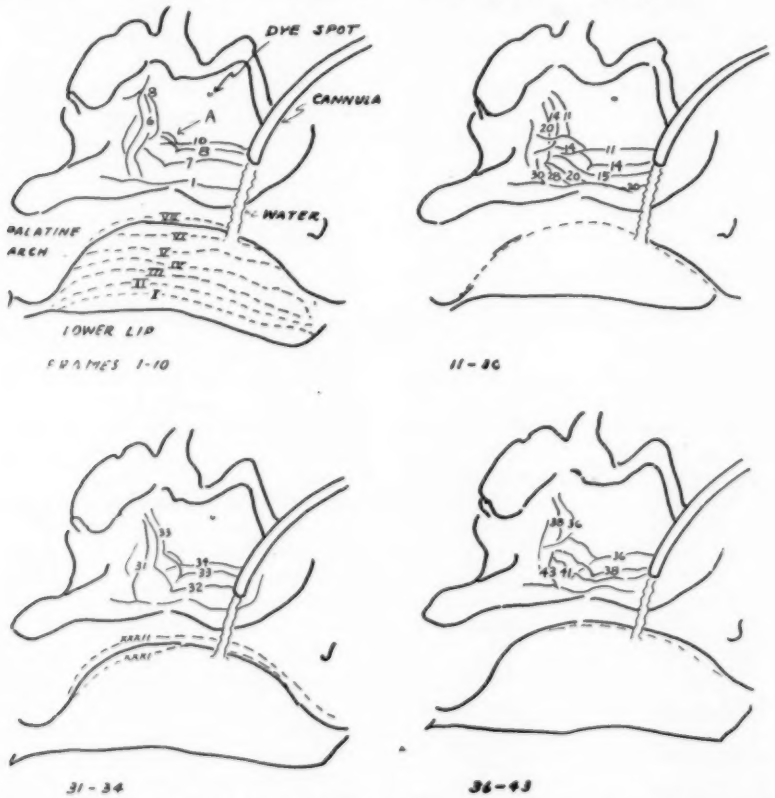


FIGURE 8. Subject 2, indicating nasopharyngeal borders, tongue and lower lip movements during swallowing water. Successive elevations of the tongue are shown by dash lines and Roman numerals. The small circle on the upper pharyngeal wall is a small spot of dye injected to provide an orientation point for comparison of positional change. A, Levator cushion.

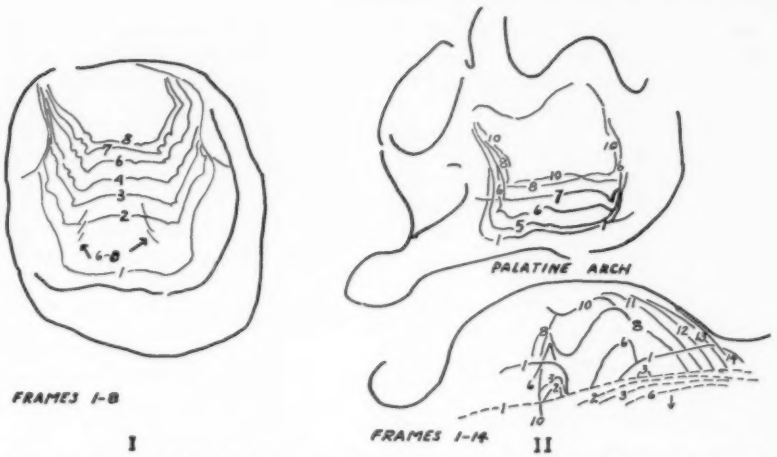


FIGURE 9. Subjects 1 and 2, indicating positional changes in the nasopharyngeal borders during formation of the vowel [ɑ]. Note 'tensor depressions' maintained by Subject 1 for frames 6 through 8.

Swallowing. Subject 2. Study of the swallowing movements of Subject 2 as illustrated in Figure 8, frames 1-43, shows an action similar in most respects to that of the first patient.

The following stages are noted:

1. Frames 1-10 illustrate the ascending phase in which there is a gradual rise of the tongue to contact the remaining third of the maxilla, as shown by the dash lines and Roman numerals through frame 7. After frame 7 the tongue tip continues in contact with the maxilla and obscures further observation of movements of the dorsum of the tongue. The first evidence of medial displacement of the lateral walls of the nasopharynx occurs in frame 6 at the torus tubarius, followed by elevation of the palate and evidence of apparent levator contraction as shown in frame 7.

2. Frames 11-30 illustrate a descending phase in which lateral wall displacement and the presence of a levator cushion can be noted to persist longer than palatal elevation.

3 and 4. Frames 31-34 and 36-43 indicate ascending and descending phases. Frames are omitted where tracings of the relatively small changes would add little information and would obscure the general patterning of movement.

Tracings (not shown in this report) of a swallowing action interposed between a series of successive speech movements of this patient shows even more distinctly the fact that lateral wall displacement toward the midline can take place even though only slight elevation of the palate is evident.

Speech. Observations of palatopharyngeal action associated with speech were made during the subjects' utterance of: (1) 12 discrete vowels and diphthongs, (2) 25 initial consonants combined with the vowel [ɑ]; (3) discrete vowels uttered at low intensity, compared with the same vowel uttered at sharply increased intensity; (4) discrete vowels uttered at low pitch, followed by the same vowel one octave higher (approximate); and (5)

connected speech samples in which the subject spoke sentences containing all of the 25 principle consonants of American speech, occuring (with a few exceptions) in the initial, medial, and final positions in the sentence. All comparative measurements and details of movement were determined from tracings of sound and silent movies projected frame by frame.

In the case of Subject 2, it was possible to compare the movements of the tongue, lower lip and palatopharyngeal borders simultaneously. At times the inferior border of the velum and the faucial arches were visible concurrently with the other structures.

Utterance of the vowel [ɑ]. Figure 9 is shown for comparison with the foregoing illustrations of palato-

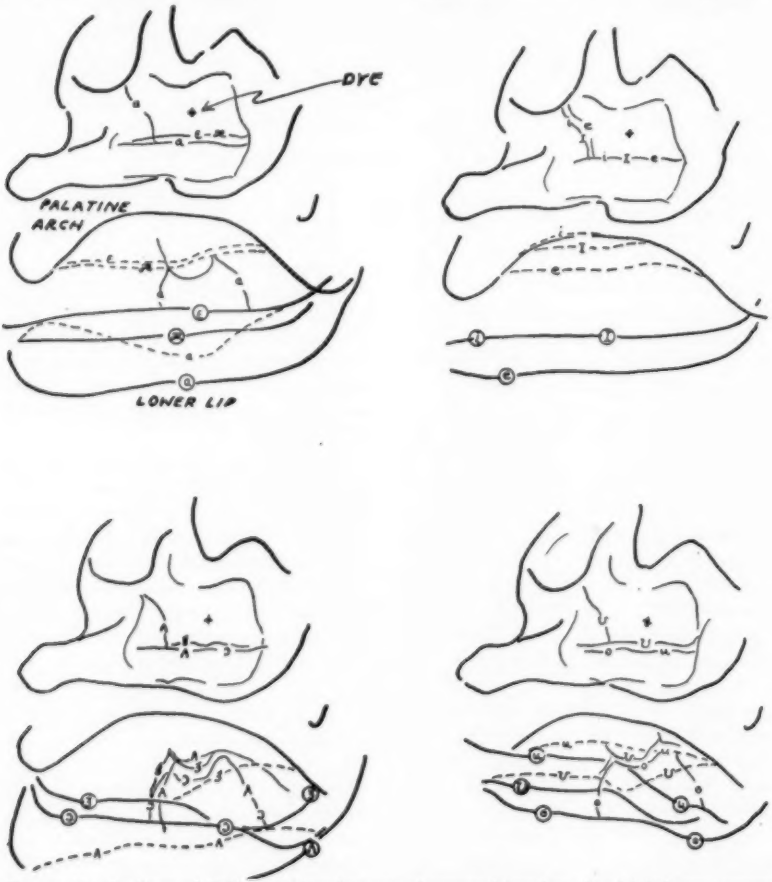


FIGURE 10. Outlines of Subject 2 showing nasopharyngeal borders, faucial isthmus, tongue and lower lip at position of sustained contraction during enunciation of vowels. Encircled symbols indicate outline of lower lip. Dash lines indicate outline of tongue. Dye spot on pharyngeal surface (+).

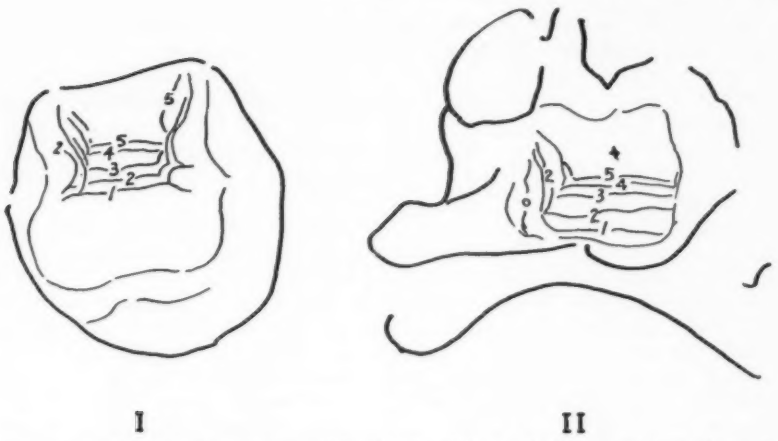


FIGURE 11. Outlines of nasopharyngeal borders in Subject 1 during enunciation of vowels and of Subject 2 during enunciation of consonants preceding the vowel [ɑ].

pharyngeal movement during deglutition. The configurations at the point of maximum contraction, and the character of the marginal changes as the nasopharynx approaches maximum contraction differ significantly from those exhibited during swallowing. The act of phonation or speech in both subjects showed little of the sphincter-like contraction observed during swallowing. The tracings from Subject 2 are of interest also because of the widening of the faucial arches which takes place beginning at frame 11 and continuing through frame 14 while palatal elevation is continued at the level of frame 10. The dash lines indicate the gradual lowering of the lingual surface until it goes beyond the field of vision. The widening of the faucial arches preliminary to relaxation (falling) of the palate was noted in many other instances of vowel utterance by Subject 2 where the tongue position allowed visualization of the oral cavity. It was noted to occur so frequently in this patient that the phenomenon can be considered as a characteristic accompaniment of vowel utterance.

Comparative palatal elevations during vowel utterances. Figure 10 presents outline tracings of Patient 2 made at the point of maximum displacement from rest during utterance of the following vowels, compared in groups of three: [ɑ æ ɛ], [e ɪ i], [ʌ ɔ ɝ], [o ʊ u]. The maximum elevation of the palate for each of these vowel utterances was compared, using as fixed points of orientation the stationary outlines of surrounding tissues and a small spot of blue dye injected into the posterior pharyngeal wall.

The comparisons show rather slight differences in total elevation of the palate, ranked as follows: at the higher elevation, [e æ ɛ ɪ i], with [e] showing the greatest amount of medial displacement of the torus tubarius; in the lower position, [ɑ ɝ ʊ o u ɔ].

Figure 11 compares the levels of maximum elevation of the palate for Subject 1 for utterance of the above list of vowels. Five levels were deter-

mined, with the vowels ranked as follows from highest (5) to lowest level (1):

Level 5. u
Level 4. ɝ
Level 3. e ɪ i ʌ ʊ o
Level 2. ɛ ɔ
Level 1. ɑ æ

It can be seen that there is considerable inconsistency in palatal elevation for the vowels as uttered by the two patients. The only fairly constant order of elevation noted from the evaluation of four series of photographic records (including some not pictured here) is as follows, from highest to lowest:

High: i u
Slightly lower: e o ʊ
Low: ɔ

Figure 11 also shows a comparison of the palatal elevations for Subject 2 during consonant enunciation which reveals the following distinguishable levels, ranked from highest to lowest:

Level 5. θ t s ʃ ʒ r g
Level 4. w ʍ p b f v ð d z tʃ dʒ j l
Level 3. k h
Level 2. n
Level 1. m
Level 0. ŋ

Level 0 is used to indicate that the nasal border of the palate was not visible in this series of pictures.

Another series of comparisons of Subject 2 enunciating the same consonants was made from a silent film. The results were not entirely consistent with the series pictured above. For what it may be worth, it was noted that the following consonants were formed with the palatal elevation consistently at Levels 5, 4 and 3:

Level 5. ʒ r
Level 4. m p v ð d z dʒ l
Level 3. h

The consonants found to occur within one level above or below level 4 were: [tʃ j θ t s ʃ k g b f]

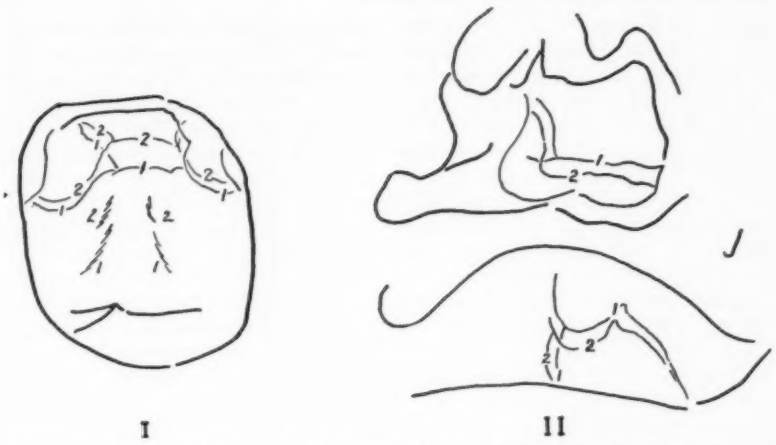
At the lowest levels, [m n ŋ] were found consistently, although it should be noted that for [m] and [n] there was some palatal elevation and medial displacement of the right lateral border.

Pitch and Stress Changes. The relationship of pitch change to palatopharyngeal movement was observed in these patients during the enunciation of vowel sounds at an approximate interval of one octave. Neither patient was able to produce the exact octave, but a clearly differentiated change of several tones was achieved. It was supposed that increased pitch and stress would produce evidence of more intense contraction of the palatopharyngeal muscles. Tracings of Subject 2 are illustrated in Figure 12, during enunciation of [ɑ] at high and low pitch. In Subject 2 the elevation was consistently lower for the high pitch than for the low pitch. Subject 1 showed about the same elevation for each pitch. Stress was not controlled, and the low pitch was uttered first. Whether or not the order of utterance had any effect on the results of the experiment is not known.

The effect of stress in relation to palatal movement was observed in both patients. No consistent pattern of elevation was found for the enunciation of the same vowels at different intensities. The unstressed vowel was produced first.

From these observations, it cannot be deduced that any clear indication of relationship between pitch, stress and palatopharyngeal action is consistently present.

Blowing. Outlines of the palatopharyngeal isthmus of Subject 1 at maximum displacement from rest in gentle and hard blowing, respectively,



I II

FIGURE 12. Subject 1 (left) indicating outline of 1, gentle blowing and 2, hard blowing; Subject 2 indicating outlines for [a] at 1, low and 2, high pitch.

are shown in Figure 12. It is evident that the elevation of the palate is appreciably greater for hard blowing than for gentle blowing. Medial displacement of the lateral tissues is about the same in each instance indicating that a simple valve function is performed in this activity.

By comparison of these outlines with those of speech and swallowing in Subject 1, it can be seen that the palatopharyngeal configurations in blowing are similar to those of speech and notably different from those of swallowing in which the peristaltic action is evident. The depressions attributed to tensor action are clearly evident in both types of blowing activity, as well as in speech and swallowing. Because of the extensive removal of facial structures it was not possible to study blowing activities of Subject 2.

Snoring, Yawning and Whistling. In simulated snoring by Subject 1 the uvula was observed to be blown into the nasopharyngeal space where it flapped rapidly against the posterior back wall of the pharynx. A similar activity was produced when the patient was asked to blow his nose.

Voluntary yawning showed a rather limited movement of the palate and lateral borders of the nasopharyngeal isthmus. In no instance was the yawning observed to accompany a degree of elevation or medial displacement of the lateral borders noted during the other activities.

The activity of the palatopharynx in whistling was similar to that employed in speech and in blowing. No appreciable forward displacement of the posterior pharyngeal wall was observed for any of these activities.

Movement of the Torus Tubarius and the Palate. The relationship between movements of palatopharyngeal tissues and the ostium of the internal auditory tube are difficult to visualize and considerable disagreement exists as to the patency or closure of the tube during swallowing (*6*). The tracings presented thus far have shown something of the movements of the torus tubarius as seen from the frontal

position in Subject 1 and from slightly to the right of the midline in Subject 2. Figure 13 shows the tracings of successive pictures of the right ostium, torus tubarius, etc. of Subject 2 at frames 1, 4, 5 and 11 up to the point of maximum palatal elevation during speech. It can be seen from these tracings that the torus tubarius is displaced in a medio-postero-superior direction, and the nasal surface of the palate is shown to become arched convexly, similar to the configurations shown for both subjects in foregoing tracings at the point of maximum palatal contraction.

The observed displacement of the torus offers no direct information concerning the circumstances attending opening or closing of the ostium, but it suggests that the ostium is opened during elevation of the torus, and shows something of the degree to which the action of the salpingopharyngeal muscle can be affected by contraction of the palatopharyngeal and superior constrictor muscles. McMyn (*6*) has shown that the salpingopharyngeus arises in part from the medial cartilaginous lamina of the Eustachian tube and (in some cases) from the palato-pharyngeus muscles. Wardill and Whillis (*9*), Townshend (*8*) and Harrington (*4*) describe the formation and action of the palatopharyngeus and the superior constrictor lying lateral to the salpingopharyngeus muscle. It can reasonably be postulated from these reports and observations from the present drawings that the medial displacement of the salpingopharyngeus is accomplished principally by the action of these other muscles and that it is not due primarily to its own contraction.

Inferences Regarding Palatopharyngeal Activity

A careful study of these subjects and an analysis of the tracings made from portions of the moving pictures made of them permit certain inferences to be drawn regarding the mechanism of the palatopharyngeal valve. It is quite possible, of course,

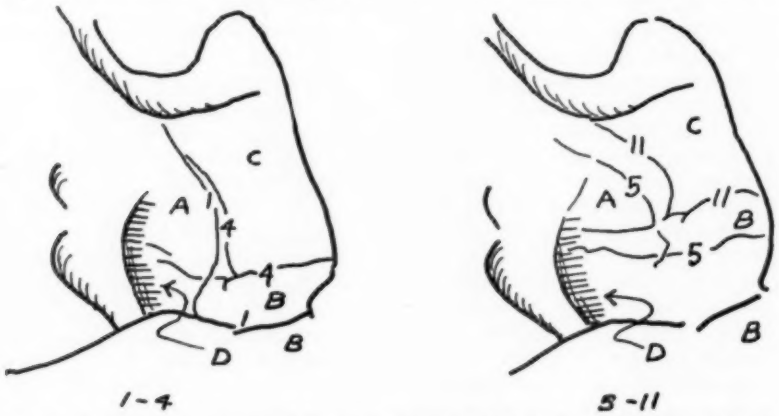


FIGURE 13. Subject 2, illustrating positional changes of right torus tubarius and nasal border of soft palate as seen from the left side during speech. Numbers indicate frames from which tracings were made. A, Torus tubarius; B, Nasal surface of soft palate; C, Posterior pharyngeal wall; D, Ostium of auditory tube.

that the common features of palatopharyngeal behavior which they show are not typical of most persons, but on the other hand there is no particular reason to suppose that they are not typical of a sizable group of persons.

The movements observed appear to be caused by a complex interaction of levator, retractor, sphincter and depressor effects, thus supporting a conclusion drawn by Harrington (*3*) that the palatopharyngeal mechanism 'does not function as a simple sphincter.' The observations also support in general the notion of 'overlapping muscular slings' as postulated by Oldfield (*5*) and others. Muscular activities are inferred from the positional changes of the mucosal surfaces of the nasopharynx.

The levator muscles contract to elevate and retract the palate somewhat during closure. The extent to which they alone are responsible for palatal elevation and retraction cannot, of course, be determined from these studies, but it is the feeling of this observer that their function is heavily influenced by simultaneous contraction of the upper fibers of the superior constrictor, labeled by Whillis (*11*) the 'palato-pharyngeal sphincter.' It appears also that if they are significant contributors to nasopharyngeal closure, their position of insertion to the palate must be farther down on the reflected posterior surface of the palate than anatomical drawings and descriptions generally represent them to be.

The configuration created by the outline of the nasal surface of the palate and the 'levator cushions' is an interesting one. An attempt to explain the muscle actions by which such shapes can occur suggests that in addition to the levator sling with its medial aponeurosis and the sphincter action of the superior constrictor we should include the downward pull of the pharyngopalatine muscles. The convexity of the nasal surface of the palate is explainable if to these muscle actions we add the fattening of the uvular muscle as it shortens in contraction.

The action of the tensor veli palatini is described by Dorrance (*2*) as follows:

> The tensor palati muscles raise the velum up to the level of the hamular processes. Beyond this point, they act as antagonists to the levators. The tensor palati muscles make the palatal aponeurosis tense . . . That portion of the tensor palati muscles which arises from the Eustachian tube . . . dilates the . . . tube.

Wardill and Whillis (*9*) note the formation of dimples on the upper surface of the palate during the act of swallowing, and they postulate that as the muscles contract they flatten, lowering the level of the palatine aponeurosis and thus assisting the tongue in driving the bolus of food backward to the pharynx. Oldfield (*5*) comments that when the palate is cleft,

> . . . the two halves of the tensor sling act independently, and tend to draw apart the edges of the anterior portions of the soft palate . . . therefore, it is important to abolish this action of the tensor when repairing a cleft palate.

To these interpretations of tensor activity should be added the observations that the dimpled depressions were noted in at least one subject (Subject 1) during speech and blowing as well as during deglutition, suggesting that the action of the tensor is synchronized and coordinated with that of the levator and other pharyngeal muscle groups. The described action and its timing probably account for the 'leakage' at the tensor region noted by some dental prosthetists after an obturator has been con-

structed for an unoperated or redivided cleft palate.

The movements of the palatopharyngeal mechanism appear to differ according to the physiological activity being performed. This was first noted by Passavant in 1869, who stated, as translated by Townshend (*8*):

> We have therefore two methods of closure of the palate; one is used during speech and is produced by the action of the superior constrictor muscles and the levator muscles of the palate. The second method of closure occurs during swallowing and is produced in the same way as in speech, but strengthened by the additional contraction of the palatopharyngeus muscles.

This observation by Passavant seems to have been generally ignored by subsequent observers, although Harrington calls attention to it (*4*) with reference to his own observations on medial displacement of the lateral pharyngeal walls during speech.

A striking contrast is shown in this study between the configurations of the valve during speech (including the various forms of pneumatic control), and those exhibited during various phases of swallowing. There is a distinct difference between the simple valve action in speech and the peristaltic-like waves observed during swallowing. These patterns of movement have not been described in the literature surveyed in connection with this study.

Another important fact ascertained is that, contrary to the observation made by Harrington (*3*) that the 'amount of medial movement is directly related to the extent of velar elevation,' both of these patients demonstrated that the two processes could take place in apparent antithesis to each other. It is this antithetic relationship observed between palate elevation and pharyngeal constriction which suggests a peristaltic action similar to that of the rest of the alimentary canal.

The following observations were made regarding the process of swallowing:

a. In Subject 1, sucking and swallowing liquids from a straw produced the highest elevation and apparently the most vigorous contraction of the valve.

b. Swallowing was accompanied by a sphincter-type contraction of the palatopharyngeal valve which was not observed in either patient during speech, blowing, or other forms of pneumatic control.

c. Although the lateral and vertical displacements of the borders of the nasopharyngeal isthmus generally appeared together during speech and blowing, they were frequently quite 'out-of-phase' during deglutition; that is, the lateral borders might be approximated while the palate approached a low position, and vice versa.

d. The angle formed by the levator muscles and the nasal surface of the palate (palatal aponeurosis) remains about the same throughout the rise and fall of the palate, the levator cushion coming into view and reaching its maximum medial positioning long before maximum elevation of the palate is achieved.

e. The amount of individual difference in palatopharyngeal activity between the two patients of this study suggests that the relationships of muscle and muscle activity may be in large part congenitally determined according to body type. Subject 1 was a 'long-head' and Subject 2 was a 'round-head.' Possibly some attempt should be made in future studies to see if true differences in palatopharyngeal structure exist on a congenital

basis. Such findings would have real value in cleft palate therapy.

f. A comparison of the time-order in which border changes of the nasopharyngeal isthmus occurred indicates that the palate and lateral walls begin to move almost simultaneously. If there is any consistent difference to be found between the two, it is probably in favor of the palate as the initiator of closure. This conclusion does not support the observation of Wardill and Whillis (*9*) that the salpingopharyngeus contracts first, followed by 'contraction of the levators and synchronous contraction of the superior constrictor muscle with production of the ridge of Passavant.'

g. Although some slight movement of the posterior wall of the pharynx could be observed in both patients, this appeared chiefly in a sort of vertical wrinkling (as if being squeezed by sphincter fibers) and possibly a slight elevation of the entire wall. In a personal communication to the author, Edward Pliske[1] has suggested that the sub-mucosal fibers of the palato-pharyngeus, the salpingopharyngeus and the stylopharyngeus may be responsible for the action.

There was no discernible Passavant's bar in these two patients. Whether or not one developed at some point below the line of vision into the nasopharynx is a matter of conjecture, but this observer saw nothing to indicate that an appreciable bar was present at any point.

The salpingopharyngeal fold was clearly visualized in Subject 1 during deglutition but was not clearly shown in Subject 2. If it was indeed present in Subject 2, it must have been rather meagerly developed and did not seem to play much part in palatopharyngeal closure. In Subject 1 the degree of medial approximation of the folds during swallowing and the maintenance of the approximation even during extensive lowering of the palate supports the observations made by Harrington (*3*, *4*) concerning the considerable vertical extent of salpingopharyngeal displacement.

It appears to this writer that the salpingopharyngeal folds are more likely to be brought to close approximation by the sphincteric contraction of the superior constrictor and the palatopharyngeus muscles than by virtue of their own contraction.

Comparison of palatopharyngeal movements during the utterance of various speech sounds revealed a pattern of configurations noticeably different from those of swallowing. The patterns suggest less sphincteric action in both speech and blowing than was observed in swallowing.

Although no clearly consistent patterns of elevation and medial wall displacement were found in the enunciation of different sounds, in general the palatal elevation for [i] and [u] was high, a finding consistent with the observations of Harrington (*3*), and [m] and [n] were enunciated with the palate at a relatively low level although some elevation above the resting position was evident.

The assumption of a 'ready position' as noted by Wardill and Whillis (*9*) during continuous speech was clearly shown to take place in the patients used in this study.

These studies show unquestionably that the torus tubarius is significantly displaced medially, backward and upwards during all types of palatopharyngeal closure. They do not suggest, however, that the torus contributes directly to the act of closure.

In passing it is worth noting that

[1] Assistant Professor of Anatomy, University of Michigan.

Subject 1 demonstrated in the movies quite clearly that the ability to inflate the cheeks and maintain the inflation is a function of valving with the tongue and palate, and has no dependence upon palatopharyngeal closure. This is something which any observer can check for himself, but since textbooks occasionally mention the trick as a test of palatopharyngeal adequacy, the fallacy of the test should be emphasized.

It seems certain that prosthodontists engaged in the construction of obturators should pay careful attention to the complex interaction of the palatopharyngeal muscles and to the observed differences in palatopharyngeal action during speech and deglutition. The practices of 'muscle trimming' often employed in obturator construction need to be reevaluated.

Summary

Observations made concerning the palatopharyngeal movements of two patients with operative facial defects have provided an opportunity for description and interpretation of the mechanism of the palatopharyngeal valve. Tracings were made of the outlines of various oral and nasopharyngeal structures as revealed through projection of successive frames of sound and silent motion pictures. The activities performed and filmed included speech, deglutition, blowing, whistling, yawning and snoring. One of the most notable features of the observations is the clear difference in character between the acts of swallowing and the various forms of pneumatic control (speech, blowing, etc.).

The findings reported by other investigators are confirmed and in some instances are contradicted by the present findings. The complexity of valve patterning and its variability for different persons and under different conditions within the same person suggests the need for a much more individualized consideration of muscle structures and actions than has generally been suggested by other observers.

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The Objective Measurement Of Progressive Esophageal Speech Development

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John A. MacGahan

Joseph C. Rickard

Neil W. Shelton

THE PHENOMENON known as esophageal speech was first reported about a hundred years ago (*4*). It has been used extensively in the rehabilitation of laryngectomized patients, however, for only a little more than the past ten years (*1*). The literature of the last decade has dealt widely with the subject. By and large these articles have concerned the results of therapy and recommended techniques of therapy. Only a very few of them have been of a research nature and most of these have been concerned with the physiological mechanisms of sound production. The others have been largely discursive without research data or findings. It appears to the present writers that a sufficient number of patients have now received the benefits of therapy and are successfully using esophageal speech to make further subjective analysis of methodology only minimally beneficial. It is held that emphasis should now be placed on such aspects as scientific evaluation of methods used, prediction of success in therapy, and recognition of the psychological problems faced by the laryngectomized patient. The present article deals with the first two of these problems; a later one will deal with the third.

It has been established, to the satisfaction of the writers, that the site of sound production used by most laryngectomized patients is the cricopharyngeus sphincter at the head of the esophagus, while the source of air supply is most probably the upper esophagus (*3, 5, 7, 8*). Beyond the research data establishing these vital mechanical factors, however, almost no objective data has been reported in the field. Several articles have dealt with estimates of success in therapy. Notable among these is the study reported by Jackson (*2*). Using a self-evaluation technique, he reports that 50 per cent of his cases achieved 'good voice.' This can be compared with the 80 per cent achieving successful voice estimated by Martin (*6*) and the 70 per cent judged as 'doing well' by Gardner (*1*). In all of these studies the evaluations were made subjectively either by the patients themselves or by observ-

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ers. Since no objective measuring rod was available the percentages reported must be considered as being relative to the individual criteria of success and therefore are not comparable.

In consequence, the writers propose a rating scale of esophageal speech which will permit objective reporting. It has been formulated in such a way that it should be equally useful for self-evaluation and for observation. Additional values should accrue from a widespread use of the scale. For example, the therapist should be able to judge the stage of recovery for his patients at any given time; the patient should be able to visualize his progress and foresee the stages through which he must go before success is achieved, and outside observers, such as the families of patients and the interested physicians and surgeons, should be able to support the patient's efforts more realistically. In addition to other values, then, the scale offers a real motivating device which recognizes the need of every patient to gauge his own speech recovery as well as to see the sub-goals which lead to normal communication.

The rating scale shown in Table 1 is felt to be more than simply a logical tool comprised of arbitrary levels established by the writers. Rather, it is an explicit statement of observations made over many years of studying the development of speech after laryngectomy. While several different therapies were used in this work, which has spanned more than a decade, the findings indicate that most if not all laryngectomized patients go through these stages in a natural progression on their path to normal speech development. The scale was derived by itemizing the stages of this progression and then establishing arbitrary limits for each separate level. The result is not felt to be an artificial or unique way of observing esophageal speech, nor does it lead to the forcing of the observations into unwieldly categories.

One salient feature of the scale should be noted. It has long been recognized that the essential problem in producing useful, audible speech after laryngectomy lies in developing for automatic use a new source of sound production. Despite this recognition there has been an almost universal tendency to consider recovery solely on the basis of speech production. It should be unnecessary to point out that speech is rarely affected by laryngectomy. Only the ability to produce sound is affected by removal of the source of sound production, the

TABLE 1. A rating scale for esophageal speech.

Level	*Esophageal Sound Production*	*Speech Proficiency*
7	None	No speech
6	Involuntary only	No speech
5	Voluntary part of the time	No speech
4	Voluntary most of the time	Vowel sounds differentiated Monosyllabic speech
3	At will	Single word speech
2	At will with continuity	Word grouping
1	Automatic	Esophageal speech

larynx, producing thereby a lack of communication between the body of air in the lungs and the articulators. This focus of attention upon speech production in therapy rather than upon the more basic problem of sound production has tended to instill in many patients an unwarranted negative evaluation of progress. It is felt that many patients discontinue their efforts to obtain satisfactory esophageal speech because they cannot visualize their progress, since sound production itself is only vaguely dealt with in the recovery program. In consequence, the scale takes into consideration the dual nature of the recovery process. First, and most important, is the progression of esophageal sound production; second, and correlated with the first, is that of speech proficiency. The scale establishes the primary importance of the esophageal mechanism and its function. There may be some observed variations in the development of speech proficiency; however, the basic function, sound production, is established in such a way that accurate observations can be recorded by any observer, trained or untrained.

Levels of the Scale

Level 7. No esophageal sound production; no speech. At this level there is usually little or no attempt at verbal communication. Patients frequently write any questions they may have or when they do attempt speech it is of the 'pseudo-whispered' type. The rating is given when the patient is unable to produce esophageal sound, either involuntarily or voluntarily.

(Note: Some patients whose operations have been extensive are incapable of making sound at the esophagus because of damage to that structure. These patients should be given a short trial at esophageal speech, but if it is not easily achieved they should be advised to use an artificial larynx.)

Level 6. Involuntary esophageal sound production; no speech. Here the patient demonstrates the ability to produce an esophageal sound. This is accomplished involuntarily, that is, not as the direct result of willing it, but as the indirect result of swallowing air. The sound produced is uncontrolled, is produced without effort, and is nothing more than the common eructation or 'belch' that is produced involuntarily by anyone. Its value lies in the recognition by both the therapist and the patient that the production of sound at the esophagus is possible. The mechanism for esophageal speech, then, is known to be intact and must be brought under voluntary control. Many patients come to therapy at this level.

Level 5. Voluntary sound production part of the time; no speech. At this stage the patient demonstrates his ability to produce esophageal sound voluntarily. The production is limited in both amount and quantity, considerable effort is expended and the effort is only infrequently rewarded. Therapy sessions may result in no more than one or two voluntary sounds. During the later aspects of this stage some sounds may be produced which contain modulation and some simple differentiation of vowels. The level is largely characterized by the inconsistency of esophageal sound production with the involuntary sounds appearing more frequently than the voluntary.

The achievement of voluntary sound production, the basic criterion of this level, is felt to be exceedingly important from a prognostic viewpoint. This accomplishment not only indicates that the musculature for sound

production is present and capable of functioning, but also that voluntary control is possible. It is felt that progress beyond this point is largely the product of practice and motivation.

(Note: When there is great delay reaching this level, special problems frequently occur. Patients often inadvertently discover the phenomenon of 'buccal speech' or 'pseudo-whispered voice.' The product here is a crude whisper, rarely intelligible and hardly useful for communication. While it is known that some writers propose such a technique as a serious alternative to esophageal speech, the present writers consider it a deterrent to maximally effective speech and discourage its practice.)

Level 4. Voluntary sound production most of the time; vowel sounds differentiated, monsyllabic speech. At this point muscular control for sound production is close to being satisfactory. The patient begins this level with the ability to produce voluntary sounds in an undifferentiated way. He then starts to make the vowel sounds differentially. With this accomplishment comes the ability to produce several short words of a single syllable. Many failures are experienced, but success is increasing and involuntary eructation is decreasing.

(Note: The tendency is present at this level for the patient to hurry his production. When this occurs the amount of intelligible sound production is decreased. Constant admonition to 'go slowly' is necessary. The emphasis must still be on sound production with speech attempts kept to a minimum.)

Level 3. Esophageal sound produced at will; single word speech. Here the patient is able to produce esophageal sound whenever he wishes. The effort is almost always rewarded. The attempts have little or no continuity, but single words, especially short ones, are easily distinguishable by the listener.

Level 2. Esophageal sound produced at will with continuity; word grouping. At this stage the elongation of sound production that permits words to be grouped in short phrases is present. The sounds follow definite swallowing effort and there is still a tendency to hurry the production in order to produce more sounds and more words on each attempt. This produces an occasional failure. The major aspect of the level, however, is the continuity of production even though it takes constant conscious effort.

Level 1. Automatic esophageal speech. Here the patient speaks with continuity. One aspect more than any other characterizes his efforts, he is now able to speak without thinking of swallowing or of eructation. His speech is effortless and, while hoarse-sounding and somewhat lacking in volume, it is naturally and easily produced. The tendency to speak without preparatory thought or effort is easily observed. Speech is rapid and automatic.

Discussion

Experience with this scale has shown it to be useful in many ways. Administratively, it has permitted the keeping of rather complete records of progress for each patient with a minimum of time and effort. It has provided a common frame of reference for discussions relative to prognosis and to progress with interested families and physicians. Therapeutically, it has proven its value many times in demonstrating progress to the patients. This has resulted in improved motivation and increased stimulation to the degree that far fewer patients are disturbed by the length of the therapy

and the slowness of the process. In addition, there has accrued the very real value of placing the emphasis more squarely upon the basic function of sound production and only secondarily upon speech proficiency. Finally, there are the advantages of an objective scale for research that have already been commented upon.

The extensive literature on speech after laryngectomy has raised many questions. Most of these have not received valid and demonstrable answers because there has been no way for true comparisons to be made on an objective basis. Some of the problems raised and unanswered which might be resolved by the use of the suggested scale are:

1. Are there demonstrable values to pre-operative orientation to speech recovery?
2. Do patients trained in a hospital setting do better than those trained outside a hospital?
3. Are artificial aids for eructation useful in the early stages of therapy?
4. Are previously operated laryngectomized patients who are now esophageal speakers the best therapists?
5. Are particular personality characteristics related to the development of esophageal speech?
6. Is the use of 'pseudo-whispered voice' detrimental to the eventual development of esophageal speech?
7. Is there a significant difference in the development of speech depending upon the economic-cultural pattern of the patient?
8. Is the use of an artificial larynx during the early stages of therapy a detriment to successful esophageal speech?
9. Are age, sex, and intelligence of the patient correlated positively with both rate of esophageal speech development and level of eventual success?

All of the above questions if answered objectively would make recovery of satisfactory communication a more positive and predictable process than it is today. It is felt that only by objective research design can these questions be answered.

Summary

An objective scale following the natural progression of the development of esophageal speech has been presented. The levels used, while arbitrarily set, are believed to be mutually exclusive. The scale points out the very essential role of esophageal sound production and the secondary nature of speech proficiency as related to it. The values of the scale in research, in therapy, and in administration have been pointed out. It is hoped that the field of esophageal speech after laryngectomy will be stimulated toward further research through the effort presented here.

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The Adaptation Effect In Stuttering Speech Behavior And Normal Speech Behavior

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M. D. Steer

RECENT RESEARCH related to stuttering has attracted the attention of investigators to the phenomenon known as the adaptation effect in stuttering behavior. The adaptation effect related to stuttering behavior refers to the discovery that the frequency of stuttering spasms is reduced during the repeated oral reading of the same passage a number of times. The phenomenon has been investigated under a variety of experimental conditions, and the degree of adaptation under such conditions has been reported. Among the many aspects of the adaptation phenomenon not reported in the literature is the relationship between adaptive behavior of stutterers versus normal speakers. It is generally recognized that the speech of normal speakers also manifests observable non-fluencies. From the point of view of modern stuttering theory it is important to know whether the non-fluency of normal speakers behaves like the non-fluency of stutterers. Another aspect of the adaptation phenomenon not previously reported concerns the concomitant physiological behavior, e.g., the behavior of the respiratory system. It would be of significance to stuttering theory to learn whether the adaptation phenomenon in stutterers or normal speakers is accompanied by systematic alteration in respiratory function.

A comprehensive study was undertaken to explore adaptive behavior in adult stutterers and normal speakers and related respiratory function. The results are to be reported in two articles of which the present report is the first. The second article will deal with the relation of the adaptation effect to thoracic and abdominal breathing in stutterers and non-stutterers.

Johnson and Knott (*2*), while studying the distribution of moments of stuttering in successive readings, noted that the per cent of words stuttered fell markedly between the first and the tenth reading. Bearss (*1*) observed the adaptation effect under conditions of random shock. Wischner (*5*) reported a resemblance between the adaptation effect in stuttering behavior and the extinction of other behavior systems, and Shulman (*4*) found that adaptation tended to be independent of the length of passage. Jones (*3*) investigated adaptation and spontaneous recovery; his stutterers read the same 250-word passage five times daily for five con-

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secutive days. Ten days later subjects were recalled for a sixth session during which they again read the same passage five times. The amount of recovery based on the last adaptation trial of the previous day was about 50% for sessions two and three and the adaptation decreased progressively for the remaining sessions.

Due to the fact that stuttering is generally considered to be a progressive disorder, in that stuttering leads to more stuttering, the adaptation effect is all the more unusual in that the stuttering spasms do not elicit more stuttering, but a reduction of stuttering.

The investigation here reported is concerned with the adaptation effect in a stuttering and a non-stuttering group.

Subjects

The subjects who participated in this study were 44 male Purdue University students, 22 of whom were stutterers and 22 normal speakers.

Eighteen of the stutterers who participated in this study were enrolled in the speech clinic for therapy. The remaining four had been enrolled in the clinic during previous semesters, but during the period of the experiment were not undergoing therapy. The 22 non-stutterers were obtained from basic public speaking courses at Purdue, with the exception of one. This exception was necessary in order to obtain a matched sample for one of the stuttering subjects.

The non-stutterers were matched with the stutterers as closely as possible with respect to sex, age, height, weight, chest and waist circumference.[1] As can be observed in Table 1, subjects were very evenly matched.

Severity ratings assigned by speech clinicians to the members of this stuttering group classified three stutterers as severe, six as average, and the remaining thirteen as mild.

Procedure

All data were collected in an air conditioned, sound treated room approximately 6′ × 10′ containing three wooden chairs for the observers, one steel examining chair for the subject, and one table upon which a polygraph was placed. The arrangement of the chairs was such that the subject sat directly facing two of the observers, the third having a view from a position approximately 45° from direct front.

[1] Subjects were matched physically as a control measure for the respiratory portion of the study.

TABLE 1. Data for matching subject pairs.

*Variable**	*Means*		*S. E. diff.*	*t*
	Stutterers	*Non-Stutterers*		
Age	20.9	19.5	.50	2.78
Height	70.8	70.4	.27	1.46
Weight	164.2	164.5	.71	.42
Chest	34.5	34.6	.15	.67
Waist	31.5	31.5	.11	.00

* Age in years; height in inches; weight in pounds; chest circumference in inches; waist circumference in inches.

TABLE 2. Analysis of variance for mean number of blocks.

Source of Variance	*Sums of Squares*	*df*	*Mean Squares*	*F*	*Sig.*
Between Subject Pairs	4392.93	21	209.19		
Between Groups	1466.47	1	1466.47	7.63	.05
Subject Pairs by Groups	4033.13	21	192.05		
Between Trials	241.53	4	60.38	11.10	.01
Subject Pairs by Trial	456.91	84	5.44		
Groups by Trial	87.16	4	21.79	3.56	.01
Subject Pairs by Group by Trial	514.40	84	6.12		
Total	11192.53	219			
Trials within Stutterers	302.96	4	75.74	7.41	.01
Trials by Subject within Stutterers	858.64	84	10.22		
Trials within Non-stutterers	25.73	4	6.43	4.79	.01
Trials by Subject within Non-stutterers	112.67	84	1.34		

The subject was asked to remove all outer clothing above the waist. T-shirts or undershirts were worn by all subjects with the exception of five who wore no undershirt. Measurements were taken and pneumographs were strapped on the subject.[2] He was then seated in the examining chair and handed a manila folder containing the reading passage, with typed instructions pasted on the outside. At a signal from the experimenter he read the passage five successive times, with a 30-second pause between readings. During the reading of the passage the observers[3] marked on duplicate copies of the passage each word upon which stuttering occurred. The same procedure was used for recording speech blocks in the normal speakers as was used for recording the speech blocks of stutterers.

The three clinician observers were instructed to count as moments of stuttering all non-fluencies or interruptions in the continuity of the reading performance of all subjects, both stutterers and non-stutterers. These non-fluencies consisted of hesitations

[2] Physical measurements and polygraph recordings were taken for the respiratory portion of the study.

[3] Staff members of the Purdue University Speech and Hearing Clinic.

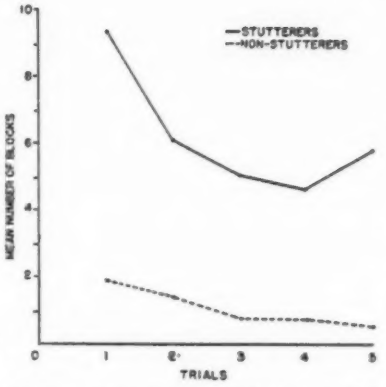

FIGURE 1. Mean number of blocks per trial by group.

or postponements, repetitions of syllables, words, or phrases, prolongations, corrected mispronunciations, starters, and retrials. Inaudible mannerisms such as preformations, rehearsal movements of the vocal mechanism, and facial grimaces, when associated with an attempt at speech production, were also counted as moments of stuttering. Both visible and audible clues were utilized to detect stuttering.

Results

Table 2 and Figure 1 indicate that significant differences in the mean number of blocks were present between groups and between trials, and the groups by trials interaction was significant. In addition, there were significant differences between trials within the stutterer group, and trials within the non-stutterer group.

The significant difference noted between groups indicates that they are distinct and separate concerning the number of blocks. The stutterers manifested a greater number of blocks on all readings.

The analysis shown in Table 2 indicates that adaptation appeared to be present in both groups. Since the groups by trial interaction was significant, however, it suggests that the adaptation phenomena are different in the two groups.

The reduction in the normal or non-stuttering group suggests a need for further research in this area relative to superior, average and inferior speakers.

Conclusions

Within the limits of the sample studied, the technique and procedure used, the statistical results suggest the following conclusions:

1. Adult non-stutterers and adult stutterers demonstrate an adaptation phenomenon in successive oral readings of the same passage.
2. The adaptation phenomena in stutterers and non-stutterers are not the same.

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A Utilization Of Adaptation Phenomena In Therapy For Stuttering

George H. Shames

IN MANY speech clinics employing a symptomatic approach to therapy for stuttering, one phase of therapy usually includes a process known as *negative practice*, which is commonly introduced after the stutterer has become aware of and has closely observed the fine details of his stuttering. The stutterer deliberately and consciously proceeds to manifest these symptoms of stuttering. A problem which has been experienced by some of our clients during therapy has been that actual stuttering blocks contaminate their negative practice efforts. This happens when the client starts to imitate his stuttering symptoms, and his deliberate effort develops into an actual involuntary stuttering block, thereby prohibiting the function of negative practice. This problem can be labeled *the contaminating effect in negative practice.*

In order to alleviate this problem of contamination, we have tried to utilize the process of *adaptation in reading*, to create a medium for negative practice which would be relatively free of involuntary stuttering blocks. Usually, the value of adaptation phenomena in studying stuttering has concentrated on thinking about etiology, dynamics and prognosis. Our experiences suggest this further value of adaptation phenomena, however, as a technique for implementing therapy. By selecting a small paragraph and asking the stutterer to read and re-read it several times, the number of involuntary stuttering blocks reduces. This is not new information but was demonstrated in studies at the State University of Iowa and summarized by Wischner (*1*). When the paragraph reading becomes relatively free from involuntary stuttering through adaptation, however, we have tried to use this medium for uncontaminated negative practice by asking him to re-read the same material and deliberately stutter while so doing.

Following successful negative practice in reading to an individual therapist, a transition is attempted from a reading medium to a conversational medium. This transition involves adaptation followed by negative practice in gradually changing situations. By introducing new variables at different times, such as adding talking to the reading process, increasing the size and varying the content of the audience, varying the length, the content and the time intervals of the reading and talking, the situations gradually begin to resemble real-life, uncontrolled talking situations. In all of these changing situations containing these variables, the stutterer could be employing relatively uncontaminated negative practice by first allowing adaptation to take place. The basic assumptions are that reading to a ther-

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apist represents a level of less situational anxiety than talking to a stranger, and that if elements of a previously adapted situation are carried over into a new situation, adaptation will take place in the new situation more easily than if these elements were not present. These assumptions are presently being regarded for experimentation.

The judgment of the client and the clinician is required to decide the length of reading material, the time intervals between repetitions of the same situation and between situations, the number of times each situation is repeated, and which situations should be included. For some stutterers these techniques were not appropriate. The number of readings required for adaptation varied from stutterer to stutterer. In addition, the transitional process has been individual and variable, fitting the needs of each stutterer. We expect deviations and modifications in each situation. These things might be decided in terms of how much contamination is present and how much adaptation takes place with the introduction of each new variable.

When the above procedures were tried by a small number of stutterers having these problems of contamination in negative practice, we found that they were able to employ negative practice with very little interference from actual involuntary stuttering. This description is not to be construed, however, as a scientifically determined or even clinically derived formula for dealing with this special problem in stuttering therapy. No reliable measuring instruments were used in varying the situations. Only individual clinical judgment was employed in reporting the efficacy of these procedures. It is intended that this be examined as a report of limited clinical experimentation and observation of adaptation phenomena, which might be of help to others in dealing with similar problems in therapy.

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A Picture-Type Speech Sound Discrimination Test

Wilbert Pronovost
Charles Dumbleton

REALIZING the need for a more adequate instrument to test the speech sound discrimination abilities of young children, Mansur (*4*) undertook the construction of a picture-type test. The test was patterned after the speech sound discrimination test originally developed by Travis and Rasmus (*5*). Twenty word pairs representing objects which could be pictured easily were selected. Each word pair was phonetically balanced so that only one phoneme varied in each word of the pair. For each word pair, four pairs of pictures were arranged in the four quadrants of an 8½ × 11 sheet of paper. For example, for the word pair 'pole-bowl,' a picture of two poles (pole-pole) were shown in the upper left quadrant. In the upper right quadrant was a picture of a pole and a bowl (pole-bowl). The same two pictures occured in the lower left quadrant but in the reverse order (bowl-pole). The lower right quadrant contained pictures of two bowls (bowl-bowl). The child being tested was asked to point to the picture containing the two stimulus words. For each of the 20 word pairs, one quadrant was selected at random to be the stimulus item so that there would be no pattern in the location of the test item. The series of 20 word pairs were repeated so that a response to the pairs in all four quadrants was obtained. Thus each phonetically balanced pair was tested four times during the test. The test was administered to 66 children who were receiving remedial reading or remedial speech. Mansur recommended that a larger sample be tested to determine reliability and validity.

Haroian (*3*) administered the Mansur test to 199 children in kindergarten, first grade and a remedial reading group. Although Haroian found the test to be a reliable instrument, she recommended that further revision be undertaken. Haroian's analysis of results showed that the location of the test item according to quadrants may have an effect upon the results. The children appeared to select the upper left quadrant more frequently than others. They obtained a higher percentage of correct scores for pictures in this position than any other position. Also, they selected the upper left picture more often when they made errors on the other three. Haroian recommended revision with a simpler arrangement of pictures, fewer responses to each word pair, and more word pairs so that more sounds would be tested.

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The present study reports the results of testing first grade children with a revision of the original test.

Procedure

Revision of the Mansur test. Some of the word pairs in the original test were eliminated as a result of the analyses of the Mansur and Haroian data. The pair 'kitten-mitten' was discriminated too easily to be retained. The pair 'picture-pitcher' proved too unreliable. Some word pairs were changed so that pictures more readily identified by children could be used. Additional word pairs were included, especially more words for vowel discrimination. The total number of word pairs in the revised test is shown in Table 1, classified as to the auditory characteristics of the phonemes compared.

The arrangement of pictures was also changed. Only three of the possible combinations of each pair of words was represented on a test page, one 'unlike' pairing and two 'like' pairings. The position of the pictures of the word pairs was selected at random in order to eliminate the factor of patterned responses. Simple line drawings were used for the pictures, which were reproduced by means of multilith. A sample picture sheet is shown in Figure 1.

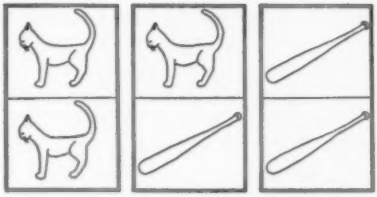

FIGURE 1. Test pictures for the pair 'cat-bat.' This picture was used for test items 1 and 37.

In administering the test, only two of the possible combinations of each pair of words were used: the 'unlike' pairing as pictured on the picture sheet, and one of the 'like' pairings determined at random. The order of presentation of the items was determined at random also. On each half of

TABLE 1. Word list for revised speech sound discrimination test classified as to auditory characteristics of the paired sounds.

Vowels	*Semi-vowels and Nasals*	*Plosives*
pen – pin	lock – rock	cap – cat
pan – pin	ring – wing	tje – pie
pan – pen	cone – comb	can – pan
cap – cup	bowl – bone	goat – boat
coat – cat		pole – bowl
ties – toes		coat – goat
knot – nut		log – lock
boat – boot		cat – bat
Fricatives	*Blends*	*Miscellaneous*
vase – face		
ice – eyes	grass – glass	pan – fan
mouse – mouth	clown – crown	chain – train
fox – socks	clock – block	stairs – chairs
chip – ship		fish – fist
watch – wash		cows – couch
zoo – shoe		bed – bread

TABLE 2. Items on score sheet for speech sound discrimination test.

1.	cat-cat	R	2	3	37.	cat-bat	1	R	3
2.	fish-fist	1	R	3	38.	fist-fist	1	2	R
3.	ship-ship	1	R	3	39.	chip-ship	R	2	3
4.	pole-pole	1	2	R	40.	pole-bowl	R	2	3
5.	cows-couch	R	2	3	41.	cows-cows	1	R	3
6.	cap-cup	1	2	R	42.	cap-cap	R	2	3
7.	pin-pin	1	2	R	43.	pen-pin	R	2	3
8.	bone-bone	R	2	3	44.	bowl-bone	1	2	R
9.	bed-bread	R	2	3	45.	bread-bread	1	R	3
10.	zoo-shoe	1	2	R	46.	zoo-zoo	R	2	3
11.	block-block	1	2	R	47.	clock-block	1	R	3
12.	coat-coat	1	R	3	48.	coat-goat	1	2	R
13.	cone-cone	1	2	R	49.	cone-cone	1	R	3
14.	chain-chain	1	R	3	50.	chain-train	R	2	3
15.	can-pan	1	R	3	51.	can-can	R	2	3
16.	clown-crown	1	2	R	52.	crown-crown	R	2	3
17.	pen-pen	1	R	3	53.	pan-pen	R	2	3
18.	boat-boot	R	2	3	54.	boat-boat	1	2	R
19.	pan-fan	1	R	3	55.	fan-fan	1	2	R
20.	lock-lock	1	R	3	56.	log-lock	R	2	3
21.	fox-socks	1	R	3	57.	fox-fox	1	2	R
22.	coat-coat	1	R	3	58.	coat-cat	R	2	3
23.	rock-lock	1	2	R	59.	rock-rock	R	2	3
24.	toes-toes	R	2	3	60.	ties-toes	1	R	3
25.	wash-wash	R	2	3	61.	wash-watch	1	2	R
26.	tie-pie	1	R	3	62.	tie-tie	R	2	3
27.	stairs-chairs	R	2	3	63.	stairs-stairs	1	R	3
28.	face-face	1	R	3	64.	vase-face	1	2	R
29.	mouse-mouth	1	R	3	65.	mouth-mouth	R	2	3
30.	knot-nut	1	R	3	66.	knot-knot	1	2	R
31.	boat-boat	1	R	3	67.	goat-boat	R	2	3
32.	ring-ring	1	R	3	68.	ring-wing	1	2	R
33.	grass-glass	1	2	R	69.	glass-glass	R	2	3
34.	cat-cat	R	2	3	70.	cap-cat	1	2	R
35.	ice-eyes	R	2	3	71.	eyes-eyes	1	R	3
36.	pan-pan	R	2	3	72.	pan-pin	1	R	3

the test, one half of the 'unlike' pairs was presented, and one half of the 'like' pairs—the picture sheets being used twice in the same order.

With these revisions of the test, one type of judgment required in the Mansur test was eliminated—that of order of sounds when an 'unlike' pair was presented. Since many young children have visual reversals, this factor, which may have affected the results on the Mansur test, was eliminated from the present test. On the present test the child, in order to respond to a presented 'unlike' pair, must make only a 'like-different' judgment. In response to a presented 'like' pair, he must make a 'like-different' judgment and an identification.

An experimental scoring sheet was devised which permitted the recording of the position of the picture indicated in response to each word pair read. This scoring sheet, showing all of the test items in the order tested, is shown in Table 2.

Administration of the test. The test was administered to 434 children in the first grades of towns in the vicinity of Boston. The several persons administering the tests were either practicing speech therapists or graduate or undergraduate students in speech with previous clinical speech training. Standard directions which were followed by all persons who administered the test are given in the Appendix. Each child was tested in-

dividually, in a small public school conference room or office, under reasonably quiet conditions. Testers were instructed to use normal speaking volume. The majority of children were tested in 10 to 15 minutes each.

Results

Range and measures of central tendency. The number of correct responses was assigned as the test score. The range of scores for the 434 children tested was from 72 to 16; the standard deviation was 6.56, the mean was 65.5, and the mode was 70. These measures indicate a distribution which is strongly skewed negatively.

While this skewedness would indicate that the test is a poor instrument for measuring a normal population where scores above the mean are of interest, it does not mitigate against its use as a diagnostic tool. When put to this use, the ability of the instrument to measure below the mean is of primary value. This skewedness, together with the fact that some children made no errors on the test, seems to indicate that most children in the first grade are capable of making speech sound discriminations of the order necessary to speak and to understand speech easily.

Approximately 10% of the children attained scores which were one or more standard deviations below the mean. In view of the skewedness of the distribution of the results of this test, one would be justified in assuming that any score one or more standard deviations below the mean would indicate poor ability in speech sound discrimination.

Reliability of the test. The reliability of the test was determined by the split-half method. Comparable halves were obtained by taking items 1 through 18 plus items 55 through 72 for one set of scores, and items 19 through 54 for the other set. This division was used rather than an odd numbered item versus even numbered item division because several of the most difficult items were by chance odd numbered.

Correlation of the two halves was by the product-moment method using raw scores. The first half-test had a mean of 32.69 and a standard deviation of 3.57; the second half-test had a mean of 32.80 and a standard deviation of 3.21. The correlation coefficient obtained between the two halves of the test was .79. Application of the Spearman-Brown formula for estimating reliability of a test when doubled yielded a coefficient of reliability for the whole test of .88. This coefficient is sufficiently high for the test to be used with confidence.

Order of difficulty. Table 3 presents the items of the test arranged in order of difficulty of the 'unlike' pairs. The use of 'unlike pairs' to determine order of difficulty was decided upon for the following reasons: (1) The 'unlike' pairs were the more difficult items; (2) in general, the 'like' pairs followed the same order, and as only two of the four possible combinations of each pair of words was used an average did not seem to be meaningful.

The order of difficulty here obtained was similar to those found by Mansur (*4*) and Haroian (*3*). The same word pairs were found among the most difficult in all three studies. The order of difficulty established in the present thesis indicates final [n]-[m], as in 'cone-comb,' to be the first most difficult sound pair to discriminate, while Haroian places [n]-[m], as in 'gun-gum,' ninth in order of difficulty. One might conclude that it is impossible to consider a specific sound pair to be adequately represented by any one particular word

TABLE 3. Percentage of correct responses to each word pair arranged in order of difficulty of the unlike pairs.

Item	%	*Item*	%
cone – comb	35.71	cone – cone	64.05
chip – ship	53.68	ship – ship	94.00
pen – pin	57.83	pin – pin	69.81
vase – face	68.20	face – face	94.47
knot – nut	73.96	knot – knot	89.86
cap – cat	79.49	cat – cat	89.63
clown – crown	85.94	crown – crown	89.63
wash – watch	85.94	wash – wash	94.93
log – lock	86.17	lock – lock	94.70
mouse – mouth	87.78	mouth – mouth	88.94
rock – lock	88.01	rock – rock	95.62
pan – pen	88.24	pen – pen	94.00
ice – eyes	90.09	eyes – eyes	97.92
goat – boat	91.47	boat – boat	97.23
coat – goat	91.70	coat – coat	95.85
fish – fist	92.39	fist – fist	93.77
grass – glass	92.85	glass – glass	97.00
cows – couch	92.85	cows – cows	97.23
ring – wing	93.08	ring – ring	98.61
bowl – bone	93.31	bone – bone	96.31
clock – block	94.47	block – block	92.62
boat – boot	94.70	boat – boat	97.00
pole – bowl	94.93	pole – pole	92.85
chain – train	94.93	chain – chain	97.00
tie – pie	94.93	tie – tie	99.07
cap – cup	95.16	cap – cap	97.92
bed – bread	95.16	bread – bread	97.69
zoo – shoe	95.62	zoo – zoo	98.38
can – pan	95.85	can – can	96.77
pan – pin	96.54	pan – pan	94.00
stairs – chairs	97.23	stairs – stairs	99.07
coat – cat	97.67	coat – coat	98.61
fox – socks	97.67	fox – fox	96.08
pan – fan	97.92	fan – fan	97.00
ties – toes	98.15	toes – toes	97.46
cat – bat	98.61	cat – cat	98.38

pair in which it may be presented. If this is the case, no conclusions can be drawn concerning the difficulty of discriminating a particular sound pair on the basis of results obtained on this test.

The only sound pairs which were used in the test in more than one word pair were those which appeared in initial and final position in different pairs. These were: [tʃ]-[ʃ], initial in the pair 'chip-ship,' which was second in order of difficulty, and final in the pair 'wash-watch,' which was eighth; [p]-[t], final in the pair 'cap-cat,' which was sixth in order of difficulty, and initial in the pair 'tie-pie,' which was twenty-fifth; and [g]-[k], final in the pair 'log-lock,' which was ninth in order of difficulty, and initial in the pair 'coat-goat,' which was fifteenth. The findings on the latter two agreed with the generally accepted idea that sounds are discriminated with more difficulty when in the final position than when in the initial position. As [tʃ]-[ʃ], reversed this order, however, it is clear that no inference can be drawn from these findings.

Of the vowel sound pairs added to the test, [ɑ]-[ʌ] in 'knot-nut' fell in the position of fifth in order of diffi-

culty, [æ]-[ɛ] in 'pan-pen' was twelfth; [ɛ]-[ɪ] in 'pen-pin,' from the original Mansur test, retained a high position, being third in order of difficulty; other added vowel sounds were well down on the list. The only inference that can be drawn is that vowel sounds, as represented by the word pairs in this test, are, as a class, discriminated with neither more nor less difficulty than consonants; some are difficult, some are easy.

Validity of test items. While it was assumed from the manner of selecting items that all items except 'cat-bat' would have 'face-validity,' a measure of the relative validity of the items was thought desirable. The per cent of correct responses on each item was determined for the upper and lower quartiles of the group. These values were then used to obtain phi coefficients (for each item of the test) from a chart in Guilford (*2*). Table 4 lists the items in order of decreasing phi coefficient of the unlike pairs.

In general, item validity was proportional to item difficulty; however,

TABLE 4. Validity of individual test items, arranged in order of decreasing phi coefficient of the unlike pairs.*

Item	*Phi Coefficient*	*Item*	*Phi Coefficient*
vase – face	.66	face – face	.26
chip – ship	.61	ship – ship	.29
pen – pin	.60	pin – pin	.41
cone – comb	.54	cone – cone	.41
cap – cat	.51	cat – cat	.26
wash – watch	.49	wash – wash	.25
clown – crown	.43	crown – crown	.40
rock – lock	.42	rock – rock	.23
mouse – mouth	.42	mouth – mouth	.40
ice – eyes	.40	eyes – eyes	.16
pan – pen	.39	pen – pen	.20
knot – nut	.39	knot – knot	.32
coat – goat	.35	coat – coat	.23
log – lock	.34	lock – lock	.26
grass – glass	.32	glass – glass	.21
ring – wing	.31	ring – ring	.10
goat – boat	.31	boat – boat	.05
bowl – bone	.31	bone – bone	.23
cows – couch	.31	cows – cows	.21
fish – fist	.30	fist – fist	.30
clock – block	.30	block – block	.29
cap – cup	.29	cap – cap	.12
bed – bread	.28	bread – bread	.14
zoo – shoe	.28	zoo – zoo	.12
pole – bowl	.28	pole – pole	.30
can – pan	.26	can – can	.18
boat – boot	.24	boat – boat	.18
tie – pie	.24	tie – tie	.10
pan – pin	.23	pan – pan	.28
chain – train	.22	chain – chain	.21
fox – socks	.21	fox – fox	.18
stairs – chairs	.21	stairs – stairs	.06
coat – cat	.18	coat – coat	.12
ties – toes	.16	toes – toes	.18
pan – fan	.16	fan – fan	.21
cat – bat	.07	cat – cat	.08

*Phi coefficient of .17 is significant at .01 level.

TABLE 5. Total incorrect responses arranged according to character of presented pair and of pair incorrectly indicated.

Presented Pair	*Incorrectly Indicated Pair*	
Unlike	First Word Self-paired	918
	Second Word Self-paired	954
	Total	1872
Like	Unlike Pair	596
	Other Like Pair	352
	Total	948

the order of validity was not identical to the order of difficulty. 'Vase-face,' first in order of validity, was fourth in order of difficulty; 'cone-comb,' first in order of difficulty, was fourth in order of validity. 'Chip-ship' and 'pen-pin' were second and third in both orders. 'Knot-nut,' fifth in order of difficulty, twelfth in order of validity. No item was very high on one list and very low on the other. The 15 lowest items were the same items in both orders, although positions were not identical at this end of the scale either.

Character of errors. Table 5 indicates that the greatest number of errors occurred when 'unlike' pairs were presented as stimuli. Twice as many errors were made for 'unlike' pairs as when 'like' pairs were presented. It will also be noted that when 'like' pairs were presented, there was a greater tendency to select an 'unlike' pair incorrectly than to select the alternative 'like' pair. For errors made on the 'unlike' pairs, little preference was given to the alternative 'like' pairs which were selected incorrectly. The first word self-paired was chosen 918 times while the second word self-paired was chosen 954 times.

Pattern of position of responses. Table 6 shows the total number of responses arranged according to the position of the correct response pictures and the position of the elicited responses. Positions of pictures are numbered left to right. Examination of this table seems to indicate that position 2, the center pictures, was favored. Fewer errors were made when the correct response fell in this posi-

TABLE 6. Total number of responses arranged according to position of correct picture and position of elicited responses (Incorrect responses italicized).

Position Correct Picture	*Position Elicited Response* 1	2	3	*Total**	*Total Incorrect*
1	10,706	*633*	*379*	11,718	*1,012*
2	*375*	10,194	*281*	10,750	*656*
3	*507*	*645*	7,528	8,680	*1,152*
Total	11,588	11,472	8,188	31,248	
Total Incor.	*882*	*1,278*	*660*		*2,820*

*In the test, correct response occurred in position 1, 27 times; position 2, 25 times; position 3, 20 times. Positions are numbered left to right.

tion. More incorrect responses on items with correct responses in position 1 or 3 fell in position 2 than in the other incorrect position. Detailed examination of the data on individual items, however, revealed that of the first eight most difficult items, only two had correct responses in position 2. This factor accounts for the greater total number of errors on items having correct responses in the other positions. That these items were valid differentiators rules out the possibility that an effect in the reverse direction was responsible for the result. Furthermore, of the 'unlike' pairs, on which more errors were made in general, only 11 had correct responses in position 2, while 13 had correct responses in position 1, and 12 in position 3. Of the relatively easier 'like' pairs, 14 had correct responses in position 2; 14 in position 1; and 8 in position 3. The trend to respond incorrectly by pointing to position 2 was not as important a factor as the data in Table 6 would indicate. There was, however, a definite tendency to indicate the middle picture when an error was made. On the 27 items having correct responses in the first position, the tendency to indicate the middle picture when an error was made was exhibited to some degree on 18 items. Of the 20 items having correct responses in the third position, this tendency was exhibited on only 11 items.

It cannot be concluded from the data that an item having a correct response in the second position of necessity made such item a favored item, although the possibility of guessing it correctly may have some slight effect on its validity.

Summary and Conclusions

The Mansur Speech Sound Discrimination Test (*4*), built in 1950 and partially validated by Haroian (*3*) in 1951, was revised. The revision took the form of eliminating some word pairs, adding other different pairs, using fewer of the possible combinations of each pair, and revising the picture sheet to obtain random positioning of the pairs with only three word pair pictures.

The test was administered to 434 first grade children. The mean, median and mode for the total group was computed and found to indicate a negatively skewed distribution. Although this is believed to indicate that the instrument is a poor one for a definitive study of a normal population, it does not decrease its value as a diagnostic instrument. Results of the test indicated that about 10% of first grade children are deficient in speech sound discrimination ability.

The reliability coefficient of the test was determined by split-half method and found to be .88.

An order of difficulty was established which essentially agreed with the order of difficulty of the original Mansur test word pairs. Variations in the order of difficulty were found, however, for sound pairs tested in both initial and final positions. Thus no conclusions could be drawn as to the order of difficulty of specific sound pairs.

An item analysis was made to determine the validity of individual items, the phi coefficient being determined for each item. It was found that only three of the unlike pairs had validities not significant at least on the .01 level.

The character of the errors made was examined, and it was found that most errors were made on 'unlike' pairs, and that of the errors made on 'like' pairs, errors of like-different judgment were most common.

The pattern of responses was examined, and it was determined that the middle picture tended to be favored.

Further examination of the data, however, revealed that this had slight influence on the validity or reliability of the instrument.

The instrument is valid and reliable, but subject to some limitations. It does not test on a high enough level of speech sound discrimination to be used in a definitive study of the abilities of the normal population. When used as diagnostic instrument, the instrument is valuable as an indicator of the adequacy of a child's speech sound discrimination abilities. The inability to find usuable word pairs which can be pictured easily, however, makes it impossible to test each difficult sound in various combinations.

A limit on the validity of the instrument in individual use is the articulation of the person administering the test. If the tester prolongs or emphasizes the sound which differentiates the words of a pair, the child's score will be higher than it should be. It was noted that while one tester scored almost 50 per cent of the children tested as making no errors on the test, all other testers on the project scored less than five per cent of the children tested as making no errors, and some scored no children as making no errors. Greater validity could be obtained if a tape recorded test were used under controlled acoustical conditions.

Appendix

Instructions for Administering Test

1. The examiner is seated beside the child.
2. Place the picture sheets in numbered sequence, face up in a pile in front of the child.
3. Go through all the sheets and name the pictured objects which the child does not recognize.
4. Use picture No. 1 (cat-bat) for familiarization instruction as follows: 'We are going to play a game with these pictures. Each page has three pictures on it like this. On this one there is a picture of a cat and a bat, a bat and a bat, and a cat and a cat. When I say two words, you point to the right picture. If I should say *cat-bat*, you would point to this one. Which one would you point to if I said *bat-bat*? Now listen carefully, because I am only going to say it once. Point to *cat-cat*.'
5. If the correct responses are made, and you are sure the child understands the procedure, proceed with the test. For each sheet, say, 'Point to ——— ———.' Read the pairs as listed on the score sheet. Go through the series of picture sheets twice, the first time using the pairs listed in column 1, and the second time using the pairs listed in column 2.
6. Beside each pair on the score sheet are two of the numbers, 1, 2, 3, and the letter 'R.' These correspond to the position of the pictures from left to right on the picture sheets. The position of the correct picture is designated by 'R.' To score, check the symbol in the same relative position as the picture to which the child points. Thus if the child points to the correct picture, you will check the letter 'R.' If he points to the wrong picture, you will check the number which indicates its position on the picture sheet.
7. There is no time limit on the test.

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An Exploration Of Group Homogeneity In Group Speech Therapy

George H. Shames

THIS STUDY is an extension of a previous investigation which dealt with prognosis and evaluation in speech therapy (*6*). The earlier paper considered the relationships between success in speech therapy and 40 biographical and psychological attributes of the individual subjects such as age, education, pre-therapy depression, etc. In addition, four methods of measuring success in speech therapy were explored. These methods involved ratings of speech and social behavior, scores on a personality questionnaire, and performance on the Rorschach test. The 37 subjects had undergone intensive speech therapy in small groups of from seven to 12 people. Within these groups they came into a great deal of contact with each other, both formally and informally. It was hypothesized at the time that the dissimilar characteristics of the groups, such as varying ranges in age, education, sex, type of speech problem, etc., may have influenced the progress of the individuals who were members of these differing 'therapeutic climates.' If this were the case, it seemed possible that a distorted picture might have been presented of the relationship between the factors studied and success. It was also hypothesized that prognostic values might be found in the *variability* of the factors as well as in the absence or presence of them.

These speculations led to the more general question of the relationship between group homogeneity and success in speech therapy. The present analysis was undertaken to determine whether the variability of relevant factors operating in a group structure is related to the success that that group attains in speech therapy.

Procedure

In studying group homogeneity and its relationship to success in speech therapy, it is first necessary to define what is meant by the term 'group.' For this study, the term was used to mean the following:

> A group shall include all of those clients in attendance in the intensive speech therapy program at the University of Pittsburgh during any one predetermined therapy period. (For this study the therapy periods were eight weeks in length.) This group shall consist of several subgroups which are not mutually exclusive from one another, but in which there is much over-lap of membership from subgroup to sub-group, depending on the therapeutic needs and activities of the individual members. When this total configuration is modified in any way (exclusive of changes in sub-group configurations), by admitting new clients or dismissing old ones, the group structure is considered changed, and a new total group is thought to exist.

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The variability of the factors investigated was the seemingly relevant dimension of group structure which could influence group therapeutic processes. Backus (*1*) recommends that a group atmosphere should be developed in which the client feels secure and accepted; one in which he feels he belongs. She also points out that the structure should permit activities which facilitate observation in the client, make available certain tools with which a client can move ahead, and allow for discussion of mutually shared experiences. In more specific terms, the present author suggests that a group structure should encourage the development of an outgoing sympathetic attitude toward the other clients, and encourage the development of an accepting 'speech atmosphere' in which the client need not have fear of negative evaluations and thereby discourage avoidance of the social use of his speech. In addition, it should enable the client to observe the speech and social behavior of the other members of the group so that he can compare his own behavior with theirs and come to recognize and understand his and their behavior. The thinking underlying the original hypothesis of the relationship of group homogeneity to success is that the above mentioned therapeutic processes will be experienced in the group, if the past experiences, attitudes, motivations and needs of the individual clients have common elements. It is suggested that these common elements will have a better opportunity to operate when the clients resemble one another in terms of age, sex, type of speech problem and types of social and psychological difficulties. More specifically, the factors whose variability was studied were:

Biographical Factors
- Age
- Sex
- Education
- Race
- Broken Home
- Residence During Therapy
- Type of Speech Problem
- Socio-Economic Level
- Marital Status
- Previous Therapy Outside the University of Pittsburgh Speech Clinic
- Therapy in a Previous Clinic Group within the University of Pittsburgh

Psychological Factors

From Guilford-Martin Inventory of Factors STDCR:
- Social Introversion
- Thinking Introversion
- Depression
- Cycloid Tendencies
- Happy-Go-Luckiness

From Bell Adjustment Inventory:
- Home Adjustment
- Health Adjustment
- Social Adjustment
- Emotional Adjustment
- Occupational Adjustment
- Social Avoidance Behavior
- Rorschach Adjustment
- Attitude Toward Speech Problem

The subjects were 37 individuals who had speech problems and had attended the speech clinic at the University of Pittsburgh for intensive speech therapy. There were 27 stutterers, two persons with voice problems, and eight with articulation problems of whom four also had cleft palates. They were both male and female, married and single, Negro and white, and ranged in age from 16 to 40 years.

In addition to data concerning the original 37 subjects, information about 14 other individuals who were members of the groups was included. These individuals included 10 aphasics, one with a voice problem, one with a cleft palate, one with a functional articulation problem, and one dysarthric. Although no measures of success in therapy were obtained

for these 14 cases, data on age, sex, etc. were available and were used. These cases therefore contributed to group variability in each of the biographical factors studied.

The therapy at the University of Pittsburgh Speech Clinic was of an intensive nature, geared to the social use of speech. The subjects attended individual and group therapy sessions for approximately five hours a day, five days a week, until in the opinion of the staff, an 'insurmountable plateau' had been reached in progress. Evaluations were made once every eight weeks. The sessions were both structured and unstructured. Opportunity was provided for specific speech habit retraining, socialization, group mental hygiene, individual counseling and carry-over of new speech habits into social situations, both clinical and non-clinical.

Four criteria were used to measure success in speech therapy. Three of these criteria were measures of change in social adequacy. They consisted of: (1) Ratings by clinicians of spontaneous social behavior (*6*); (2) Factor S, a measure of social introversion obtained from the administration of the Guilford-Martin Inventory of Factors STDCR (*4*, *6*); and (3) a Rorschach Adjustment Score, obtained from the Davidson sign approach in interpreting the Rorschach (*2*, *5*, *6*). Criterion 4 was an estimate of speech adequacy as measured by clinicians' ratings of randomly presented pre- and post-therapy recordings of the subject's speech (*6*). In all instances, an estimate was made of the amount of change between pre-therapy and post-therapy behavior by making ratings or administering tests before and after therapy. Only negligible correlations were found to exist between changes in social adequacy and changes in speech adequacy.

By employing the operational definition of a 'group,' eight different small therapy groups were identified. Since the defined structure was so sensitive to change due to new admissions and dismissals in the clinic, these eight groups were not mutually exclusive, in that an individual might easily be a member of more than one group.

An attempt was made to identify the 'most' and the 'least' successful of the eight groups for each criterion of evaluating success in speech therapy in the following way:

> The 37 subjects from all eight groups, for whom evaluative data were available, were ranked from one to 37 on each criterion of success. That subject showing the most change was thought to be the most successful and was ranked number 1. That subject showing the least change was ranked number 37. A tabulation was made of the group memberships of each of the variously ranked subjects on each criterion. An analysis was then made to find out what the mean rankings of the individual groups were, with reference to the ranks of their members. This resulted in an 'average rank' for each of the eight groups on each criterion. As an example, Group 2 was made up of eight subjects whose ranks on Criterion 1 were 1, 5, 7, 10, 14.5, 18.5, 28.5, and 28.5. By averaging these individual ranks, the mean for Group 2 was found to be 14.1.

By using the above procedure for determining the average rank for each group on each of the criteria for success, it was found that a 'most' and a 'least' successful group could be identified with statistical significance on only one of the criteria. This criterion was Ratings by Clinicians of Spontaneous Social Behavior. On this criterion the average rank of the 'most' successful group was 11.4. The average rank of the individuals in the 'least'

successful group was 26.2. The difference between these average rankings was significant at the .01 level of confidence.

On the criterion of Factor S, the average rank of the 'most' successful group was 13.4, while the average rank of the 'least' successful group was 22.1. This difference was not significant at the .05 level of confidence.

On the criteria of Rorschach Adjustment and Ratings of Speech Adequacy, no clear-cut distinction could be made between the groups to establish one as 'most' successful and one as 'least' successful. On the criterion of Rorschach Adjustment, two of the eight groups were tied for 'most' successful with average ranks of eight. On the criterion of Ratings of Speech Adequacy, three groups were tied for 'most' successful with average ranks of 12.5. From a subjective inspection of the raw data collected on these two criteria, it was felt that the instruments, as used, were not discriminating enough. This was evident from the clustering of scores. On the fourth criterion, 23 of the 33 subjects for whom data were available were placed in one category.

In summary, only one criterion of evaluating success in speech therapy could differentiate one 'most' and one 'least' successful group with statistical significance. This occurred on Criterion 1 Ratings by Clinicians of Spontaneous Social Behavior, which showed a difference significant at the .01 level of confidence. On the other three

TABLE 1. Comparisons of 'most' and 'least' successful groups on ratings by clinicians of spontaneous social behavior.

Variables	*Most Successful Group*			*Least Successful Group*		
	Mean	σ	*Percentage*	*Mean*	σ	*Percentage*
Biographical						
Age	24.2	7.3*		23.5	9.1	
Sex			100*			84.6
Education	9.7	2.4*		11.2	3.5	
Marital Status			100*			84.6
Race			77.7			100*
Socio-Economic Level	5.5	1.7*		5	2.1	
Previous Therapy			66.7*			53.8
Broken Home			77.7*			53.8
Therapy Holdovers			100*			69.2
Residence During Therapy			55.5			61.5*
Type of Speech Problems	4*			6		
Psychological						
Social Avoidance Behavior	12.2	2.1*		9.8	3.7	
Social Introversion	28.1	6.2*		29.7	10.4	
Thinking Introversion	36.4	6.8*		34.3	10.9	
Depression	31.7	10.1*		26.0	13.9	
Cycloid Tendencies	39.0	9.4*		31.4	14.0	
Happy-Go-Luckiness	42.1	8.6		34.8	6.4*	
Home Adjustment	8.7	5.9*		8.6	6.8	
Health Adjustment	5.9	3.4*		5.3	3.7	
Social Adjustment	21.9	5.0*		18.0	8.8	
Emotional Adjustment	14.6	6.0*		11.4	6.5	
Occupational Adjustment	10.6	8.2		5.1	4.1*	
Rorschach Adjustment	7.4	2.8		8.3	2.5*	
Attitude Toward Speech	104.9	28.5		98.6	13.7*	

*Group showing least variability.

criteria, two opposing groups could either not be identified, or the difference between them was not statistically significant. Because of these results, statistical analysis of group variability was limited to the two groups on Criterion 1.

Results

The means and standard deviations of the measurable dimensions of the two groups were computed, and differences between the groups were reported. The statistical significance of these differences was not reported because it was felt that such statistics would be meaningless since the sample was obviously not representative, and since the differences would have to be extremely large to be significant with such small numbers. However, the direction of these differences was noted for trends. In instances where standard deviations could not be computed because of the type of data, ratios and clustering of individuals into categories were used to determine variability. This was done on such variables as sex, marital status, broken home and race, which were clear-cut discrete categories. Table 1 summarizes the results of this analysis.

From Table 1 it can readily be seen that when success was evaluated with Criterion 1, there was an overwhelming weighting of less variability of group dimensions in the 'most' successful group. Eighteen of the 24 dimensions studied were less variable in the 'most' successful group. Of the 11 biographical factors studied, nine of them showed less variability in the 'most' successful group. All except race and residence of the subject during therapy had smaller standard deviations, or clustered into lesser numbers of categories. Of the 13 psychological dimensions studied, nine of them showed less variability in the 'most' successful group.

Although these differences in variability between the two opposing groups were consistent from factor to factor, they were many times very small, and probably not statistically significant. Observation of such consistent though small trends toward greater homogeneity in the more successful group, however, seems unusual enough to encourage speculation about the clinical significance of these results as well as about the statistical significance.

The sign approach (*3*) was used to determine the probability of getting 18 out of 24 estimates of greater homogeneity in the 'most' successful group by chance alone. The *P* value was found to be .01, indicating that only once in 100 times could such an alignment of greater homogeneity in the 'most' successful group be due to chance.

It is interesting to note how similar are the two opposing groups on this criterion of success when their means are compared. There is practically no difference in the mean age, education and socio-economic levels of the two groups. There is also very little differentiation in the mean scores of social introversion, thinking introversion, home adjustment, health adjustment, social adjustment and attitude toward their speech problem. Yet there are the differences in variability. These findings tend to support the hypothesis that prognostic values might be found in the *variability* of these descriptive factors.

Summary and Conclusions

The purpose of this analysis was to investigate the relationship between group homogeneity and success in speech therapy. Four criteria were em-

ployed for estimating success and identifying a 'most' and a 'least' successful group. Only one criterion of the original four was able to differentiate a 'most' and a 'least' successful group with any statistically significant reliability. This criterion was Ratings by Clinicians of Spontaneous Social Behavior.

When success was measured by this criterion, 18 of the 24 group dimensions showed less variability in the 'most' successful group. These findings were significant at the .01 level of confidence. Although far from conclusive, these results strongly suggest that when individuals in a speech therapy group resemble one another in age, education, sex, socio-economic level, type of speech problem, and types of social and psychological difficulties, they will attain, on the average, greater success than individuals in a group in which there are wide ranges among the members in age, education, types of problems, etc. It must be remembered, however, that these results can only be reported as research oriented clinical observations.

Since the reported observations are not supported by individual tests of statistical significance, it is felt that any application of these findings at this stage should be with an experimental attitude of testing whatever hypotheses have resulted from this analysis.

It is obvious that research in the areas of measurement of success, prognosis, and group structure is in its very early exploratory stages, in terms of its most basic elements. The methodological problems of how to study and investigate these areas and set up research designs are as much an area of investigation as are the content variables, which seemingly have more practical clinical application. The reliability and validity of findings concerning content variables, however, becomes a function of the research methods employed, and research on one cannot be separated from research on the other. The results of this study seem promising and strongly suggest that these questions of methodology and content are worthy of research on larger, more representative numbers, so that more conclusive basic answers can be obtained.

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The Response Of Profoundly Deaf Children To Auditory Training

Clarence V. Hudgins

CONGENITALLY deaf children, or those who lose their hearing due to accident or infection during the prespeech period, must rely upon vision and the remaining sensory modalities in learning speech and language. By special techniques these children acquire adequate skills in lipreading and speech which permit them to communicate with hearing people. A large percentage of children in schools for the deaf are profoundly deaf with hearing losses in the speech range of 80 db and upward. A smaller proportion are partially deaf with losses ranging from 60 to 75 db. This latter group may have little or no speech upon entering schools for the deaf and must be taught as deaf children. Since they have a relatively large residuum of hearing, however, they make considerably greater progress than the profoundly deaf group in acquiring communication skills, provided that hearing aids are available and that they have an adequate program of auditory training.

It is generally agreed that hearing aids are teaching aids and that, at least above the primary level, auditory training is best effected by employing the equipment throughout the day in the regular school program where pupils hear and read the lips simultaneously. Group hearing aids do not provide a basically new method of teaching the deaf but are considered as a means of facilitating communication with deaf children. Hearing aids, therefore, augment the efficiency of established methods.

Until recent years the use of hearing aids in schools for the deaf has been confined largely to the partially deaf group, while the profoundly deaf pupils were considered beyond the reach of hearing aids for all practical purposes. With the development of more powerful hearing aids, however, it has been possible to stimulate acoustically even the very profoundly deaf children. Furthermore, evidence is rapidly accumulating regarding the effectiveness of auditory training for this group, especially in the areas of speech perception and speech intelligibility (*3, 5, 6, 8, 9, 11*).

This is a progress report on an experimental program which was designed to study the effectiveness of auditory training for profoundly deaf pupils in a residential school for the

Clarence V. Hudgins (Ph.D., Clark, 1932) is Director of Research on Speech and Hearing, Clarke School for the Deaf. The program reported was partially supported financially by a grant from the National Research Council. The Council's Committee on Deafness through its chairman, Hallowell Davis, and Frank H. Reiter, a member of the Committee and Principal of the Clarke School during the first two years of the program, rendered valuable assistance in the design of the experiment and by frequent criticisms and helpful suggestions. Mary E. Numbers, Supervising Teacher of the Intermediate Department, was most useful in facilitating the testing program.

deaf. Specifically, the primary objective of the program is to show to what extent the small remnant of hearing in profoundly deaf children may be trained and employed in the educational program when the very best of acoustic equipment is available. A secondary objective is to compare the results obtained by means of a specially designed group hearing aid with those obtained by means of the standard 'run of the mill' group hearing aids available during the late 1930's and the early 1940's.

Experimental Program

The Central Institute for the Deaf undertook the design and construction of two group hearing aids which embodied the latest features intended to reach profoundly deaf children in the most effective manner.[1] One of these instruments was installed at Clarke School in March 1948 where the controlled experimental program to determine the effectiveness of the unit was to be conducted; the other unit was installed at the Central Institute for the Deaf, in St. Louis.

The experimental hearing aid is capable of picking up a sound spectrum in the intensity range of 48 to 95 db and amplifying it with a minimum of distortion to deliver, into 1 to 36 pairs of earphones, sound pressure levels as high as 140 db (re. 0.0002 microbar) over an essentially linear band of 100 to 8,000 cps. Provision is made to limit automatically the output level at any predetermined point by means of a compression amplifier. A high pass filter (Audio Development Company, type AX 1720) which attenuates frequencies below 500 cps at the rate of approximately 15 db per octave is inserted in front of the compression amplifier. The action of this filter reduces the hazards of feedback at high intensity output levels without materially interfering with speech intelligibility.

Two sets of earphones, each set powered by a separate amplifier, are available on the instrument: Permoflux type PDR-10, and Western Electric insert type, 724 series. The pupils in the experimental class preferred and were permitted to use the insert type earphones fitted into individual earmolds with binaural cords. These were used throughout the experimental period.

The experimental room was 18 × 20 feet with a 12-foot ceiling. It was made relatively sound absorbent by covering all wall spaces and ceiling with acoustic tile. The floor was covered with a heavy wall-to-wall rug. Four dynamic microphones suspended from overhead wires were placed in positions designed to pick up speech signals equally well from any point in the room.

The group hearing aids in use at the Clarke School at the beginning of the experimental period, 1948, were all of a similar design and construction. Each unit consisted of an audio amplifier capable of delivering approximately 2 watts into a 5,000 ohm load. On the basis of 3 samples measured, the amplifiers have a voltage gain at 1,000 cps of 45 to 50 db before serious distortion. There was no compression amplification or power limiting devices other than the power limits of the instruments.

In addition to the amplifier the unit consisted of a crystal microphone on the teacher's desk, 10 pairs of Brush Crystal Earphones (Type A) and individual volume controls for each

[1]For a detailed technical description of these hearing aids see Silverman and Harrison (*10*).

pupil. The over-all frequency characteristics of the equipment are 'flat,' within the limits of the earphone frequency response.

The plan of the experiment was that of comparing the progress of matched groups of profoundly deaf children under different educational procedures. An experimental class spent the entire day in the experimental school room using the special hearing aid described above and taught by the regular teaching staff of the intermediate department. A control group occupied the regular classrooms in the same department and were taught by the same teachers. The essential difference in the treatment of the two groups was that of the quality of the hearing aids and the special classroom available to the experimental group. It was not possible to follow strictly the experimental design of matched groups in the study because (1) the matching with respect to age, grade level, and previous acoustic experience was achieved only to a limited degree, and (2) all the classrooms, none of which were acoustically treated, were equipped with the standard group hearing aids described above and these were available to the control group. Furthermore, the school began to replace the inferior equipment with modern hearing aids during the experimental period. One of these modern aids which was practically equivalent in quality and performance to the experimental aid was available to the control group for one period during each day.

The data to be presented, therefore, emphasize the effectiveness of adding auditory training to current methods of teaching profoundly deaf children rather than a comparison of two groups trained under widely different regimens. Actually both groups received the same type of training, differing only in the relative quality of the group hearing aids and classrooms available. The experimental group was provided with the very best of acoustic equipment, while the control group was using for the most part the mediocre hearing aids available at the time. In presenting the data, however, comparisons of the relative gains of the two groups will be made since the achievements of the control group represent the average level of teaching, and pupil response to that teaching, during the experimental period.

Subjects

Experimental Group. The class was composed of eight pupils between the ages of 9 years 6 months, and 12 years 10 months with an average age of 11 years 11 months. Table 1 presents significant clinical data for the group. The average educational age of the class was 9 years 1 month, or the 4th grade level, at the start of the experiment. Six of the eight pupils are listed as being congenitally deaf, while the remaining two lost their hearing following meningitis. Five of the eight pupils were profoundly deaf. Of the remaining three with losses in the better ear at the start of the program of approximately 65 db, one pupil, C. G., became more severely deaf following an upper respiratory infection in the Spring of 1949. The loss in the speech range for this subject increased approximately 20 db over a relatively short period. Another pupil, B. P., showed a decrease in hearing loss of approximately 12 db in both ears during the two-year period. This apparent gain in hearing acuity is probably due to improvement in attention rather than in actual auditory acuity.

TABLE 1. Clinical data for the experimental and control groups.

Pupils	*Chron. Age June 1948*	*Incidence and Causes of Deafness*	*Pure Tone Hearing Loss (Av. 512, 1024, 2048 cps)*			
			L.E. June 1948	*R.E. June 1948*	*L.E. June 1950*	*R.E. June 1950*
Experimental						
B. C.	12–2	Meningitis—16 mos.	95	90	98	98
K. C.	12–6	Congenital	68	72	76	85
C. G.	12–6	Congenital (Rubella)	83	65	100	85
R. G.	9–6	Meningitis—7 yrs.*	95	108	95	110+
B. P.	11–1	Congenital	97	98	83	85
R. R.	12–10	Congenital (Rubella)	65	77	63	80
R. S.	12–2	Congenital	85	58	100	65
C. W.	12–6	Congenital	78	78	70	70
Mean	11–11		83	80	86	85
Control						
C. C.†	10–3	Congenital	85	77	73	73
B. D.	13–2	Congenital	107	103	98	98
B. H.	13–6	Congenital	102	97	100	96
C. H.†	10–1	Unknown	58	50	60	60
W. K.	13–4	Congenital	102	105	110	110
M. M.†	12–1	Partially deaf at birth	65	63	75	73
A. R.	14–8	Congenital	75	102	90	100
B. S.	14–1	Congenital	85	87	80	70
H. S.†	9–10	Meningitis—Before 9 mos.	82	78	93	95
W. T.†	10–9	Congenital	85	92	86	85
R. T.†	10–1	Congenital	98	100	85	85
L. W.†	9–2	Congenital	90	90	95	95
Mean	11–9		86	87	88	86

*Had had some transient deafness before this.
†Members of a single academic class.

Control Group. It was impossible to obtain a control group that would match the experimental class in all of the essential details because of the limited number of pupils available. It was decided, therefore, to select a group of 15 pupils which came nearest to matching the experimental class. Three of the group of 15 dropped out during the experimental period leaving 12 pupils for whom comparative data are available. Seven of the 12 pupils were in a single class and were beginning their second year in the Middle School. The members of this class are indicated in Table 1. Their average chronological age in June 1948 was 10 years 4 months; their average educational age was 8 years, or one year less than that of the experimental class. The remaining five pupils in the control group were selected from advanced classes. The average chronological age for the control group as a whole in June 1948 was 11 years 9 months, and their average educational age was 8 years 9 months. The distribution of hearing losses is similar for the experimental and the control groups. The control group will be treated as a single group for purposes of presenting the comparative data on the several achievement tests. Table 1 gives the available clinical data.

Tests

Both the experimental and the control groups were tested at the beginning of the experimental period and periodically during the entire two-

year period. The achievement test battery is divided into four parts. With the exception of the educational achievement, the tests were administered in September, March, and May of each year. The educational achievement tests were administered in December and June.

Speech Perception. In this study the term 'speech perception' is understood to be the process by which the physical characteristics of speech, including both the visual and the acoustic aspects, are perceived as language symbols. Hence lipreading, hearing, or the two combined, 'look and listen,' are employed in the process.

Tests were conducted as follows: Monosyllabic word lists,[2] 50 words each, were used. The words were read by a teacher using the carrier phrase 'Write ——— now.' The voice was monitored by means of a sound level meter.

Before starting the tests the speech level was effectively equated for all pupils by adjusting the individual desk attenuators to the threshold of each pupil as the talker repeated the single word 'now, now, . . .' The method is as follows: First the output attenuator of the hearing aid is set at an appropriately high output level. A 5-watt Hewlett-Packard attenuator is inserted in the circuit between the compressor amplifier and the power amplifier and set at 30 db attenuation. As the talker repeats the word 'now' at a constant level the desk attenuators are manipulated by the experimenter and the threshold for each pupil is determined by the method of limits. The setting of each desk attenuator is recorded for the convenience of repeating the settings in subsequent test periods. The individual desk attenuators are calibrated in discrete steps of 3 db. A check is occasionally made to determine the accuracy of the original threshold setting. The thresholds for speech serve as a common reference level for increasing or decreasing the intensity of the speech signals. By means of the master attenuator in the circuit, it is possible to administer tests over a 40 db range at levels that are essentially equivalent for all members of the group with reference to threshold. The test scores can then be plotted as a function of gain relative to threshold in the form of articulation curves and average scores read from the curves.

Words lists are read at levels of 10 db below threshold, at threshold, and at 10, 20, and 30 db above threshold with the pupils looking at the speaker. The first two levels are tests of lipreading only since the speech signals are either below or at threshold level. At levels of 10, 20, and 30 db above threshold, however, pupils are hearing as well as looking at the speaker. Hence, any increase in the score above the previously established lipreading level can be attributed to hearing.

The tests of 'hearing only' are given at levels 20 and 30 db above threshold. These tests are measures of pure auditory speech perception since the pupils do not look at the speaker. Speech signals at the highest level, i.e., 30 db above the thresholds of the most profoundly deaf pupils, may reach a level of 130 db (SPL) or more. Physical measurements of the earphones (WE 724) indicate a harmonic distortion of 2% at 130 db (SPL).

The pupils write down the words as they understand them. Papers are scored on the basis of per cent words correct. The segment of the articulation curve at the zero and at −10 db

[2] PBF (Phonetically balanced, familiar) lists, described by Hudgins (*4*).

levels is taken as the pure lipreading score, while the point of maximum rise of the curves is taken as the 'look and listen' score. The difference between the pure lipreading score and the maximum 'look and listen' score is a measure of the effects of auditory training upon speech perception.

An additional lipreading test, the Heider Lipreading Film, was also used. The film shows the face and upper torso of a teacher reading 30 sentences containing 118 key words. The test is scored on the basis of the percentage of key words correct.

Speech Intelligibility. Samples of the speech of each pupil were recorded on tape and later appraised for intelligibility by a crew of trained listeners. Two types of material were used: a 50-word PBF list, and lists of 10 unrelated sentences. The pupil was brought into a sound-treated room and permitted to read over the material before it was recorded, during which time he was coached on the sounds that gave him trouble. The procedure to be followed was then explained. During the recording the experimenter pointed to the test item as a signal to the pupil and at the same time repeated its number, which was recorded and later became a guide for the listeners. Pupils were permitted to repeat obviously mispronounced words. Whatever coaching was necessary is recorded on the tape. In cases of obvious errors of articulation the experimenter asked the pupil to repeat the word, meanwhile pointing to the mispronounced sounds on a chart showing the English sounds in familiar phonetic symbols.

A group of five college students served as listeners. They were first given a period of training in order to become familiar with the testing procedures and with the speech of deaf children. Training consisted of listening to speech records of a group of deaf pupils and writing down the items. It was found that after six two-hour training periods on consecutive days, their scores had reached a learning plateau. Further training consisted in having the listeners appraise the speech records of 60 pupils of the general school population. Finally, the records of the experimental and the control groups were appraised. The median per cent of the five listeners was taken as the intelligibility score. The sentence lists are scored in the same manner. The same listening crew served for all speech intelligibility tests during the experimental period.

The factor of speech rhythm is important for intelligibility (*4*); hence, scores for speech rhythm were obtained from the recorded sentences. Basically, speech rhythm has to do with the grouping of syllables into unit groups. These are given stress patterns as a result of the accentuation and subordination of individual syllables within the groups. Fluency and intonation may also be considered as attributes of speech rhythm, but of a second order of importance, since the proper grouping and stressing of syllables predetermine the rate of utterance and influence, to a degree, the intonation or melody of the phrase. The tests of speech rhythm employed in this study consisted simply of grading the 10 sentences spoken by each pupil and recorded as a part of the speech intelligibility test. A skilled listener has no difficulty in writing out in appropriate symbols the rhythmic pattern of each sentence as the tape is replayed. Normally a speaker is permitted some choice in the accentuation of words in any simple sentence. A sentence is considered rhythmically incorrect, however, when (a) the ac-

cented syllables of polysyllabic words differ from common usage, (b) when unimportant words are stressed, and (c) when all words and syllables in the sentence are given with equal stress (absence of grouping). The rhythm score is based upon the number of sentences spoken with correct rhythm.

Speech Production. Tests of speech production were developed in order to measure progress on the part of pupils in the physiological aspects of speech. Breath control as exercised by the breathing muscles and the utilization of breath in speaking largely determine the rate of utterance, the length of phrases, and the grouping of syllables and words in breath groups (phrases). These factors in turn determine to a considerable degree the intelligibility of speech. Kymographic recordings were made of the breathing movements during quiet breathing and during speech breathing. A simple prose paragraph of 90 syllables was read repeatedly by the pupils while their breathing movements were recorded from two trunk levels: the lower chest and the mid-abdomen. The method of recording has been described by Hudgins (2). Two types of physical measures are obtained from the recordings: (a) Phrasing, the number of respiratory cycles (phrases) necessary for the paragraph, and (b) Fluency, the time required for reading the entire paragraph.

Educational Achievement. The regular primary and intermediate forms of the Stanford Achievement tests were employed for testing general educational achievement. Scores are recorded in terms of chronological age, educational age, and grade equivalent.

Results

The results for the experimental and control groups are presented separately, and comparisons are made under the assumption that the two groups were properly matched for age, hearing loss, educational achievement, and previous acoustic experience. As noted above, the matching was only approximate because of unavoidable restrictions in available pupils. Under the circumstances, therefore, the problem becomes one of determining: (1) What benefits may profoundly deaf pupils derive from an educational program in which a high-powered hearing aid is used throughout the day? (2) What advantages may be had from the use of the specially designed hearing aid as compared with equipment that must be considered relatively inferior?

The results of the two-year program show conclusively that profoundly deaf children are defintely benefited by the use of hearing aids, and that, given high-powered equipment capable of amplifying sound well above their thresholds, these benefits are considerable. These conclusions are further confirmed by the results of a second experimental group, younger than the first, conducted two years later. The results of this second experiment will be summarized later in this article. The results of the first two-year program are presented below.

Speech Perception. Lipreading. The experimental and control groups started the experiment with approximately the same scores in lipreading. The mean initial scores for the PBF-word lists were 37 and 38 per cent for the two groups, while those for the Heider film test were 55 and 52 per cent (see Table 2). The PBF word

test is more difficult than the Heider film test since the former consists of monosyllabic words without context while the film test is made up of sentences in which the test items are the key words.

Both groups made significant gains in lipreading during the experimental period as measured by the PBF words. This gain does not appear in the scores of the Heider film test. Both groups made the greater gains during the first year. The experimental class gained an average of 20 percentage points as measured by the word test while the corresponding gain for the control group was 14 points. This difference of 6 percentage points is not statistically significant. Scores for the profoundly deaf pupils only in both the experimental and control groups indicate that the relative gains for these groups remain approximately the same although the average scores are slightly lower.

The scores are based upon words correctly written down. Credit is not allowed for the substitution of homophonous words. The scoring of these natural errors as correct lipreading responses would elevate the score by 10 to 15 percentage points.

Hearing Only. Very few of the pupils in either group were able to understand speech to a useful degree by ear alone at the start of the experiment. Mean initial scores for the 'hearing only' tests were 17 and 14 per cent for the experimental and control groups, respectively (see Table 2). After one year the experimental group had a mean of 35 per cent, a gain of 18 percentage points, while the control group remained approximately at the initial level with a mean of 11 per cent. At the end of the second year neither class showed further gain in speech perception by ear alone. The mean scores were 37 and 14 per cent, respectively. The experimental group made an over-all gain for the two-year period of 20 percentage points while the control group remained at the same level. Four members of the experimental class and two of the

TABLE 2. Mean scores and standard errors of the means in speech perception and speech intelligibility for experimental and control groups over the two-year experimental program.

	Experimental		*Control*	
	Mean	σ_M	*Mean*	σ_M
Speech Perception				
Lipreading (PBF Words)				
1948	37	4.27	38	3.03
1949	55	5.22	48	3.89
1950	57	4.88	52	4.73
Gain	20		14	
Lipreading (Heider Film)				
1948	55	4.18	52	3.78
1949	62	4.33	55	3.19
1950	60	4.33	54	2.51
Gain	5		2	
Hearing Only (PBF Words)				
1948	17	7.10	14	6.67
1949	35	8.59	11	5.42
1950	37	10.9	14	7.37
Gain	20		0	
Look and Listen (PBF Words)				
1948	54	6.70	44	5.71
1949	72	6.61	54	6.63
1950	73	5.81	61	5.32
Gain	19		17	
Speech Intelligibility				
PBF Words				
1948	51	7.5	40	6.7
1949	56	6.9	49	4.8
1950	58	8.9	41	5.8
Gain	7		1	
Sentences				
1948	84	6.9	65	7.1
1949	86	7.3	80	5.4
1950	82	10.9	66	8.8
Gain	— 2		1	
Rhythm Analysis				
1948	84	5.60	70	8.0
1949	90	3.8	81	6.2
1950	88	4.9	75	6.5
Gain	4		5	

control group reached a level of auditory perception that may be considered adequate for speech perception by ear with the help of powerful hearing aids. Two of these pupils were in the profoundly deaf group.

Look and Listen. Taken alone, the 'hearing only' scores, especially those of the profoundly deaf pupils, indicate that either the acoustic training program has relatively small effects upon speech perception, or, its effects are not fully revealed by the 'hearing only' test. The scores of the 'look and listen' tests suggest that the second of these alternatives is correct. When the ear is permitted to augment the eye, as in the 'look and listen' tests, it is possible to show significant gains in speech perception for all of the pupils in both the experimental class and the control group. The 'look and listen' test has a higher degree of sensitivity than the 'hearing only' test for revealing relatively minor achievements in auditory speech perception. Even at the beginning of the experimental program most of the pupils in both groups obtained higher scores on the 'look and listen' test than they did on lipreading alone. This may be attributed to the fact that most of the pupils in each group have used group hearing aids during their previous school experience.

Table 2 shows that the mean initial scores were 54 and 44 per cent for the experimental and control groups, respectively. The final scores were 73 and 61 per cent, representing mean gains of 19 and 17 percentage points during the period. Calculation of the mean scores for the profoundly deaf pupils only shows a reduction in the means, but the relative gains remain approximately the same.

A further analysis of the lipreading and 'look and listen' scores is presented in Table 3. The purpose is to demonstrate the true effects of auditory training upon speech perception. The differences represent the gain in speech perception when eye and ear are combined. The 'look and listen' scores were higher than the lipreading scores by 11 percentage points or more for six of the eight pupils in the experimental class. The mean difference is 16 points. Thus it appears that the perceptive capacity of the ear when combined with that of the eye boosts the mean speech perception for the experimental group to 73 per cent. Comparisons show that these scores based on PBF word lists correspond to a score of 90 per cent or better for connected speech.

Table 3 shows that the mean difference between lipreading and 'look and listen' scores existed at the start of the experiment in 1948. During the experimental period, therefore, pupils made equal gains in both lipreading and in 'look and listen.' The experimental class, using the special group hearing aid, made exceptional gains in speech perception during the two-year period as shown by both lipreading and 'look and listen' tests. Apparently a gain in the one is accompanied by a gain in the other provided that auditory training is made available.

The records of individual pupils will be of interest. Outstanding in the experimental group is R. G., who is exceptional in many ways. He became

TABLE 3. Difference between mean look and listen (LL) and lipreading (LR) scores at the beginning and at the end of the experimental period.

	Experimental			*Control*		
	LL	*LR*	*Diff.*	*LL*	*LR*	*Diff.*
1948	54	37	17	44	38	6
1950	73	57	16	61	52	9

profoundly deaf (95 db in the better ear) at the age of 7 years and entered Clarke a year and a half later in 1947. Thus, he had been in school one year at the start of the experimental period. Although he was severely deaf, his memory for words worked to his advantage when speech was presented at a high level through a powerful hearing aid. During the two-year period in the experimental group he gained 43 percentage points in hearing only. In lipreading he gained 16 points and during the same period his score in 'look and listen' rose from 60 to 83 per cent.

Another pupil in the experimental group, B. P., will illustrate what an auditory training program may accomplish for congenitally deaf pupils. This pupil in 1948 had a mean loss of 97 db and in 1950 this had shifted to 83 db (see Table 1). At the beginning of the experimental program her score in hearing only was 4 per cent, two years later it was 19 per cent; the initial lipreading score was 34 per cent, two years later it was 54 per cent; the initial 'look and listen' score was 52 per cent, two years later it was 71 per cent. Thus, while this pupil may never be able to understand speech to an effective degree by ear alone, a score of 71 per cent of PBF words obtained by a combination of eye and ear indicates a very efficient speech perception capacity. Equal gains in lipreading and 'look and listen' suggest that an auditory training program offers considerable promise for some congenitally deaf pupils.

Not all of the pupils in the experimental class showed the spectacular gains of the two mentioned above. Two pupils, K. C. and C. W., whose hearing losses are 76 and 70 db respectively, showed only slight gains in 'look and listen' scores as compared with those for pure lipreading. These same pupils showed gains in lipreading during the two-year period of 19 and 15 percentage points. In 'look and listen' they gained 25 and 22 percentage points. Their scores in hearing only are zero on all tests. Subsequent tests administered in 1951 and 1952, however, indicate that these two pupils have begun to use their hearing more effectively in speech perception.

The cases of these two pupils as compared with those mentioned above exemplify a significant problem in the field of acoustic training, namely, pupils who present almost identical clinical pictures when given equal opportunities differ widely in their responses to the auditory training program. This problem has been analyzed recently by Hopkins (*1*). Further information will be available as this program progresses.

The control group gained in both lipreading and 'look and listen' during the period, although to a lesser degree than that of the experimental group. Differences of 12 percentage points or more between lipreading and 'look and listen' scores were found for 3 out of 12 pupils. Two of these, C. H. and M. M., are not to be considered as profoundly deaf children (see Table 1), but may be compared with R. S. and R. R. of the experimental group who have similar hearing losses. The remaining members of the control group showed relatively small differences on the two tests. At the start of the program the control group with the exception of three pupils showed very little difference between lipreading and 'look and listen' scores.

The evidence offered here indicating that lipreading does not suffer under a schedule of auditory training is of special interest to educators of the

deaf. It was formerly believed by most teachers that the constant use of hearing aids would interfere with the development of this skill. There was never any real basis for this belief, however, and data presented in this report as well as the experiences of the school as a whole completely disprove this notion. We can say with assurance that auditory training is beneficial to lipreading as well as to other aspects of the education of the deaf.

Speech Intelligibility. Speech intelligibility is measured by the number of test items understood by a group of listeners. Since two types of test materials are used in testing intelligibility, monosyllabic words and sentences, two sets of scores are available.

PBF Words. The means for the two groups are presented in Table 2. The experimental class in 1948 had a mean intelligibility of 51 per cent as compared with 40 per cent for the control group. At the end of the second year of the experiment the experimental group had a mean gain of 7 percentage points while the control group gained only 1 point. Two individuals in the experimental group gained 15 and 28 percentage points during the two-year period while one showed a loss of 6 points. The remaining pupils made gains from 0 to 6 points. In the control group five showed losses ranging up to 14 points, while the remaining seven made gains from 1 to 18 points.

Sentences. The intelligibility scores for sentences were all relatively high. The experimental class started the experiment with a mean of 84 per cent, while the control group had a mean of 65 per cent (see Table 2). At the end of two years neither group showed any gain in mean score although there were some changes and shifts in individual scores. For the deaf pupils studied in this experiment, sentences do not provide a precise test for intelligibility. Scores were too high at the beginning to show any real gain on the final test. The PBF word test is much more difficult and therefore a more sensitive test for our purposes, since the speaker must be precise in his articulation of each word in order to be understood. Sentences, on the other hand, demand less of the speaker in terms of articulatory precision. Context and rhythm become useful cues for the listener in understanding the total sentence. Hence, sentences as test material fail to discriminate critically over a wide range of speaking ability.

The sentence scores are correlated ($.81 \pm .03$) with the PBF word scores and therefore permit conversion of word scores into sentence scores. Sentence scores can be predicted from PBF word scores with an accuracy of approximately 10 per cent.

It will be of interest to compare the speech intelligibility scores of the pupils in the experimental group with those of the school population as a whole. Speech intelligibility tests are administered to all pupils in the middle and upper school each year. The method of testing and test materials (PBF word lists) were identical to those employed with the experimental groups and the recordings were judged by the same group of listeners. The scores of 31 pupils, including the control group which had been tested in 1948 and again in 1950, were available for comparison. The mean intelligibility for this group in 1948 based on the PBF word tests was 31 per cent (S.D. 22). An intelligibility score of 30 to 40 per cent as measured by PBF word lists represents a score of 70 to 80 per cent as measured by

sentences (*4*). The average gain of 8 percentage points for this group was approximately the same as that of the experimental group. The general level of speech intelligibility in the experimental group, however, was considerably higher—58 per cent in 1950 (see Table 2).

The available data on speech intelligibility indicate that the auditory training program above the primary grades affects only slightly speech intelligibility as measured by the tests described here. It is quite likely that auditory training is most effective for speech development at the primary level. Here pupils are laying a foundation for speech, and they may be greatly benefited by auditory cues at this early stage whereas at a later stage in speech development these same auditory cues are less effective in modifying speech habits already well established. Evidence supporting this point of view is provided by a recent study of Wedenberg (*11*). Furthermore, observations similar to those described above of an experimental group of third grade pupils show a decided improvement in speech intelligibility. These results will be summarized later in this article.

Speech Rhythm. The experimental class was superior to the control group in speech rhythm scores at the start of the experiment. The mean scores were 84 and 70 per cent, respectively (see Table 2). This superiority was maintained throughout the two-year period but the gains in both cases were not statistically significant. The scores indicate the percentage of sentences that were spoken with the correct rhythm pattern.

Speech Production. Phrasing. The ratio of the number of phrases required for the deaf pupils to that for normal speakers in reading the test paragraph gives a measure of the amount of deviation from the norm. A ratio of 1.0 would mean a normal phrasing coordination. Ratios greater than 1.0 indicate the degree of deviation.

The experimental class had a mean phrasing ratio of 2.47 at the start of the experiment and a final average of 2.26, with a mean gain of .21 or 8.5 per cent. The control group, on the other hand, had a poorer phrasing score at the start (3.26) and reduced this to 2.76, a gain of .50 (15 per cent) during the two-year period.

Fluency. The ratio of the time required for deaf pupils to read the test paragraph to that for normal speakers is a measure of relative fluency of the speech of deaf pupils. A ratio of 1.0 indicates normal fluency, those greater than 1.0 indicate a slower-than-normal speech.

The experimental class had an average initial fluency ratio of 1.70 and a final ratio of 1.50; a gain of .20 or 12 per cent. The control group had an initial fluency ratio of 1.77 and a final score of 1.70; a gain of .07 or 4 per cent.

Educational Achievement. Both the experimental and the control groups made gains during the two-year period in some aspects of communication skills. Any gains in communication skills should be reflected in general educational achievement during the same period. The Stanford Achievement Test Battery was administered periodically in order to measure progress in educational achievement and to determine any differences in the two groups.

The mean educational achievement scores are presented in Table 4. The significant scores are those representing grade equivalent which are derived from the raw scores obtained

TABLE 4. Mean educational achievement scores of the experimental class and the control class for the two-year experimental period.

	Experimental		*Control*	
	Mean	σ_M	*Mean*	σ_M
Chronological Age				
1948	11–11		11–9	
1949	12–11		12–9	
1950	13–11		13–9	
Gain	2–0		2–0	
Age Equivalent				
1948	9–1		8–9	
1949	10–2		9–4	
1950	11–4		10–2	
Gain	2–3		1–5	
Grade Equivalent				
1948	4.1	.15	3.5	.32
1949	5.1	1.5	4.4	.25
1950	6.3	.47	5.2	.26
Gain	2.2		1.4	

from each test in the battery. The table gives the mean chronological age, mean educational age, mean grade equivalent, and the gains for the two groups. The experimental class was slightly in advance of the control group educationally at the start, and this gap was widened considerably during the two-year period. The experimental group gained 2.2 grades during the two-year period while the control group gained 1.4 grades.

It is a well established fact that deaf children are retarded educationally by an amount ranging from one to five years by the time they reach eighth grade level. This is due largely to the difficulty encountered in acquiring language and communication skills. Occasionally a very brilliant pupil will reduce the amount of retardation to zero and leave the school with a normal grade for his age. These are exceptional cases. It is still too early in the experiment to determine to what extent auditory training will affect educational achievement. Results to date suggest that the use of hearing aids throughout the school day raises the general level of educational achievement and reduces the degree of retardation.

Conclusions

Experience with the experimental group indicates that constant use of a powerful high fidelity group hearing aid throughout the school day is of considerable benefit to deaf children. Improvements in speech perception, general educational achievement, and to a lesser degree speech intelligibility, were demonstrated. Pupils enjoying the advantage of the experimental aid showed considerably greater gains as compared to pupils in a control group who used the standard hearing aids of the type used throughout the school. The results of the experimental program with respect to speech intelligibility, however, were less clearly demonstrated. It is suggested above that auditory training may not be especially effective in improving speech intelligibility for pupils at the age levels of those used in this previous experiment and that younger pupils might be more responsive to auditory speech stimuli.

Second Experiment

A second experimental group was later selected, which was younger than that employed in the previous study by an average of two years, in order to test the hypothesis that younger pupils would improve more in speech intelligibility. There is evidence that gains in that area were considerably greater for the second group than for those observed in the previous group.

Observation began on the second experimental group in the Fall of 1950. Complete sets of data are available for

them during the following two years ending June 1952. The same series of tests were administered at the start and periodically throughout the period. The group was composed of eight profoundly deaf children, seven of whom are congenitally deaf, the eighth became deaf at the age of 8 years as the result of meningitis. At the start of the period of observation the group was beginning its first year (third grade level) in the Middle School. The age range for the group was 8 years 11 months, to 10 years 6 months. The mean age was 9 years 8 months. They were all profoundly deaf, with a mean hearing loss of 97 db in the speech range. Table 5 summarizes the clinical data for the experimental and control classes.

As a means of evaluating the relative achievements of this group, two sets of comparative data are available. These are: (1) Test scores obtained from a control group of seven pupils, five of whom are profoundly deaf and two partially deaf. These pupils were one year in advance of the experimental group at the beginning of the testing period. (2) Test scores for speech intelligibility and educational achievement over a two-year period obtained from five classes representing all academic levels in the Middle and Upper Schools.

Speech Perception. The experimental group made significantly greater gains in lipreading during the two-year period. Both the experimental and the control group made significant gains on the 'look and listen' tests with no differences appearing between the two groups. Neither group was able at the end of two years to understand speech by ear alone.

Speech Intelligibility. The experimental class gained 15 percentage points in speech intelligibility as measured by the PBF word lists and 27 percentage points as measured by sen-

TABLE 5. Clinical data for the experimental and control groups in second experiment.

Pupils	*Chron. Age*	*Incidence and Causes of Deafness*	*Pure Tone Hearing Loss (Av. 512, 1024, 2048 cps)*			
			L.E.	*R.E.*	*L.E.*	*R.E.*
Experimental						
	Sept. 1950		*June 1950*		*June 1952*	
R. A.	9-1	Meningitis—8 years	80	115	71	93
R. B.	9-9	Congenital	98	95	93	93
K. B.	8-11	Congenital	113	116	113	115
S. B.	10-5	Congenital	100	101	103	105
R. K.	9-1	Congenital	101	100	100	100
A. McA.	10-0	Congenital	105	100	100	103
R. McE.	10-6	Congenital	81	90	96	95
Mean	9-8		97	102	97	101
Control						
	Sept. 1948		*June 1948*		*June 1950*	
C. C.	10-6	Congenital	85	77	73	73
C. H.	10-4	Unknown	58	50	60	60
M. M.	12-4	Partially deaf at birth	65	63	75	73
H. S.	10-1	Meningitis—before 9 mo.	82	78	93	95
W. T.	11-0	Congenital	85	92	86	85
R. T.	10-4	Congenital	98	100	85	85
L. W.	9-5	Congenital	90	90	95	95
Mean	10-4		80	79	81	81

tences over the two-year period. The control class, meanwhile, remained at approximately the same level. A comparison of this gain in speech intelligibility of the experimental class and that of five regular classes in the school during the same period shows that with one exception the gains were significantly higher for the experimental class.

Educational Achievement. The gains in general educational achievement over the two-year period show a slight advantage for the control group. The average gains in grade equivalent were 1.4 and 1.7 for the two groups. This difference is not statistically significant.

During a similar two-year period, two of the five classes for whom comparative data are available made gains of 1.5, and the remaining three classes gained considerably less during the same period.

Discussion

The observations presented above indicate that group hearing aids are effective when employed throughout the day even with profoundly deaf pupils. Their effectiveness with this group, which embraces the majority of the population in most residential schools, will of necessity be limited. It is not likely that many of these profoundly deaf children will ever be able to understand speech to a useful degree by ear alone. Our present opinion is that the measurable benefits that may be expected lie in the direction of an increased facility in communication. This takes the form of an increased ability in speech perception in which the eye plays the major role (lipreading), but assisted to a considerable degree by the remnant of hearing that has been trained by means of powerful hearing aids. Another very important benefit is derived from such training once it is achieved, namely, pupils may continue to use their hearing effectively, once the training has been accomplished, by means of modern individual hearing aids. We also find that the full use of group hearing aids is beneficial to speech development and results in a higher level of speech intelligibility, especially when they are made available to young children.

An improvement in communication skills results in an improvement in general educational achievement. There is no indication at the moment that the educational process will be accelerated as the result of auditory training but a higher level of speech perception should result in a broader language development and language usage; thus, the quality of the education will be improved.

There are further benefits derived from an auditory training program that are more difficult to assess objectively but none the less recognized. Both teachers and pupils are aware of them. Efforts to express these benefits verbally result in such expressions as these: 'A more relaxed atmosphere in the classroom'; 'greater ease of getting and holding the attention of the class'; 'children want to hear and complain when the hearing aid is not working.'

The results of the study also show rather conclusively that in order to bring these benefits to profoundly deaf children it is essential to have high powered equipment, capable of presenting undistorted speech signals at levels up near the threshold of pain, and with a power-limiting device that protects the ear against discom-

fort or acoustic trauma. Finally, the modern equipment in order to function at maximum efficiency must be installed in a relatively non-reverberant room.

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Vowel Recognition As A Function Of Duration, Frequency Modulation And Phonetic Context

William R. Tiffany

IT HAS BEEN commonly assumed or implied that the essential physical specification of a vowel phoneme could be accomplished in terms of its acoustic spectrum as measured over a single fundamental period, or over a short interval including at most a few cycles of the fundamental frequency. That is to say, each vowel phoneme has been assumed to have a unique energy vs. frequency distribution, with the significant physical variables all accounted for by an essentially cross-sectional analysis of the vowel's harmonic composition. It may not be without significance, however, that the evidence so far produced in support of an energy-frequency specification of the vowel has been somewhat equivocal.

At least four recent studies (*4*, *6*, *9*, *10*) have been made in an effort to account for distinctive phonemic character using the technique of spectrographic analysis. Three of these (*4*, *9*, *10*) have been concerned with the measurement of the frequencies of the first two resonance bars (regions of energy predominance) for a number of repetitions of the same series of vowels followed by the plotting of the obtained frequencies on coordinate paper to obtain a single point for each vowel. On these coordinate plots an attempt has been made to set broad graphical limits within which the points representative of a particular phoneme would fall. Potter and Peterson (*9*) found, however, that considerable overlap was obtained between the distributions of points for presumably different phonemes, particularly for those closely adjacent on the vowel diagram.

Edmondson and Horwitz (*4*) found similar overlapping areas and proposed three possible explanations: (1) that phonetic context was important for recognition; (2) that vowels which lie in overlapping areas are not in fact separate phonemes and would have been confused by listeners (They note the need for additional data); and (3) that the first two resonance bars are not sufficient cues. Edmondson and Horwitz believed this third explanation to be the most likely.

Potter and Peterson (*9*) report that the addition of higher frequency resonance bars in a multidimensional plot does not contribute substantially to the desired graphical separation for distinctive phonemes. Using a three-dimensional or 'three-bar' plot they found slight but hardly significant gains.

In a recent paper Potter and Steinberg (*10*) conjectured that the over-

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lapping of the measured physical properties of perceptually different phonemes might be due to one or more of three factors: (1) limitations in the identifications of the sounds; (2) errors in measurement; or (3) neglect of additional information used by the ear. They appear to suggest strongly that vowels whose first two formant regions show overlapping of physical properties would be found to show phonemic overlapping as well.

If, as Potter and Steinberg suggest, overlapping vowels will, when judged by a jury of listeners, receive 'overlapping judgments' it may be supposed that the judgments will be divided among the phonemes which overlap. It is interesting to note, however, that there is some evidence to show that this may not be the case. Siegenthaler (*11*) has reported that at supra-threshold levels listeners tend to hear the neutral vowel when they err in identification. Edmondson and Horwitz (*4*) report that they have some evidence of this sort also.

To summarize:

1. It has frequently been assumed that the frequency location of the first two or three formants would reveal the common invarient attributes of each vowel.

2. Attempts to define these formant frequencies have generally employed analyses of single isolated segments-in-time of the vowels studied.

3. When such vowel analyses have been made and compared for the utterances of several speakers the results have frequently not yielded consistent distinctive physical characteristics for vowels which were presumed to be perceptually distinctive.

4. Some, although not conclusive, evidence indicates that errors in vowel recognition may not be related in an obvious way to the overlapping of physical characteristics revealed by these analyses.

It would seem pertinent, therefore, to examine this matter of the physical specification of the vowel in an effort to throw some additional light upon the physical variables influencing vowel recognition.

With respect to cross-sectional definitions of the physical attributes of the vowel it is to be noted that at least three kinds of violence are done to the vowel-in-speech when this type of analysis is used. In *connected* speech, vowels (1) vary continuously in fundamental frequency; (2) are surrounded, and presumably influenced by, adjacent sounds; and (3) have measurable and varying durations. A single-time segment of a vowel tells nothing of these elements which may conceivably carry information useable by the ear in phonemic identification. Potter and Steinberg (*10*) make essentially the same observation when they state:

> It should be noted also . . . that we are representing a vowel by a single spectrum taken during a particular small time interval in its duration. Actually a vowel in the word . . . undergoes transitional movements from initial to final consonant. Not only does the spectrum of the vowel change with time, but the ear in identifying the word has the benefit of all the changes.

Purpose

The purpose of the present study was, therefore, to investigate the possible influence on vowel recognition of certain cues which may be present in connected speech, but which are not considered in a cross-sectional analysis of the acoustic spectrum of a vowel. The main questions asked were these:

1. Does the presence of frequency

modulation throughout the course of the vowel have a significant effect upon the consistency with which listeners identify a particular sound as belonging to a particular phoneme?

2. Do changes in vowel duration produce significant changes in identification scores?

3. Are there systematic variations in the recognition of vowel sounds which are associated with the character of the onset and termination of the vowel phonation? That is, are there systematic differences among the following types of vowel productions: (1) vowels produced in a phonetic context–specifically in syllables having [t] as the initial consonant and [p] as the final consonant; (2) vowels in isolation, i.e., detached from other sounds but with speaker-controlled onset and termination; and (3) vowel segments, i.e., vowels from which the onset and termination portions have been removed from the recorded whole-vowel?

4. Which vowel sounds are most difficult to identify and which kinds of errors in identification are characteristically made in a supra-threshold listening situation?

The answers to these questions should provide information concerning the extent to which it is possible to specify the physical nature of a vowel solely in terms of its acoustic spectrum at a single moment of time somewhere in the course of the vowel, or conversely, the extent to which the variations inherent in the contextual speech *pattern* are required for a complete specification of the physical characteristics of distinctive vowel phonemes.

Procedure

Controlled phonations of the 12 commonly distinguished vowels of the General American dialect were obtained from four trained speakers to produce a set of tape recorded stimuli composed of the following kinds of phonations:

1. Vowel *segments* of 0.08, 0.2, 0.5, and 8.0 seconds duration, i.e., vowels of varying durations from which the onset and termination portions were edited from the original tape recordings.

2. Vowels in a [t]-[p] context, i.e., vowels spoken in nonsense syllables with [t] as the initial and [p] as the final consonant, at a speaker-controlled vowel duration of 0.2 seconds.

3. Vowels spoken in isolation, i.e., without adjacent vowel or consonant sounds, and with speaker-controlled durations of 0.2 seconds.

For each of the above types of stimuli there were two conditions of inflection. For the eight-second condition the entire set of 12 vowels was intoned with as little vibrato as possible and again with a definite vibrato. For the shorter vowels there was a condition of rising inflection (of about 10 tones per second) and a condition of 'level inflection.'

The recording was controlled as carefully as possible to obtain a standardized set of phonemes from the various speakers, with a minimum amount of speaker variation in frequency modulation, pitch level, intensity level, and phonemic quality. The speakers had been chosen for similarity of vowel quality and pitch level and for their ability to produce the required inflections and vibrato. They were further trained to control intensity level and duration, and to produce the particular pitch variations required. The vowels chosen for study were [i ɪ e ɛ æ ɑ ʌ ɝ ʊ ɔ o u].

Following recording but prior to editing, a panel of three expert judges

TABLE 1. Total number of correct identifications made of each vowel for each condition for all speakers combined.*

	Condition											
	0.08		*0.2*		*0.5*		*8.0*		*Iso.*		*[t]-[p]*	
Vowel	*I*†	*NI*‡	*I*	*NI*	*I*	*NI*	*I*	*NI*	*I*	*NI*	*I*	*NI*
e	19	5	53	32	92	60	89	96	141	135	140	142
ʌ	109	110	107	103	79	94	97	98	125	116	113	108
ɔ	97	72	121	95	131	120	107	126	102	90	88	98
ɪ	139	118	114	106	66	58	89	52	92	121	143	143
ɛ	116	113	137	112	120	107	73	86	141	118	112	128
ɑ	51	45	94	106	136	101	136	111	103	101	136	138
ʊ	131	125	126	118	91	97	90	83	128	113	129	116
o	100	119	131	114	140	127	128	115	142	127	142	136
u	131	127	141	138	139	142	144	141	130	136	134	139
æ	124	118	142	124	144	143	144	144	143	144	144	144
i	135	135	144	143	143	144	143	144	139	143	144	142
ɝ	143	142	144	140	144	144	144	144	144	144	144	144
Mean	108	102	121	111	119	111	115	112	128	124	131	132

*Each entry based upon the correct identifications of 18 listeners hearing the vowels of four speakers presented twice. Maximum cell total, 144.

†Inflected.

‡Not inflected.

either agreed that, within practical limits, the desired vowel standardization had been obtained, or the speaker was asked to re-record the questionable phonation. Vowels were rejected unless all three of the judges found the phonations to be 'reasonably representative of the phoneme.' In this connection it should be stressed that what was desired in these experimental phonations was not a random sample of speaker-determined phonemes, but a set of vowels which were as nearly standardized as possible.

In the editing of the tape-recorded phonations all vowels and conditions were randomized for each speaker. They were then presented twice over high quality play-back equipment at approximately 60 db above threshold to a group of 18 trained listeners in a sound isolated room. These listeners were requested to respond by writing one of a given list of 12 phonetic symbols for each vowel heard. Suitable practice periods and instructions preceded the listening sessions.

Results

The responses of the 18-member listening panel provided two recognition scores for each of the 12 vowels at four conditions of duration (0.08, 0.2, 0.5, and 8.0 seconds), three conditions of 'context' (segmented, isolated, and [t]-vowel-[p]), and two conditions of inflection (inflected–non-inflected, or vibrato–non-vibrato) for each of the four speakers.

These data have been combined for the four speakers and two presentations and are presented in Table 1. A study of this table will reveal some

TABLE 2. Analysis of variance of the main effects and interactions for inflections, durations, and speakers.

Source of Variation	df	[e] Mean Square	F†	[ɑ] Mean Square	F	[ɔ] Mean Square	F	[o] Mean Square	F	[ɛ] Mean Square	F	[ɪ] Mean Square	F	[ʌ] Mean Square	F	[ʊ] Mean Square	F
Inflection	1	56.25	6.05	45.56	<1	28.89	1.73	9.00	1.19	12.25	<1	85.56	117.20**	2.64	<1	3.52	<1
Duration	3	320.86	30.85**	297.79	14.71**	77.43	3.00	24.06	2.04	96.42	1.96	251.36	25.52**	25.27	1.00	104.47	4.34*
Speakers	3	98.77		18.04		47.35		22.61		72.42		60.23		138.14		27.52	
I×D	3	16.87	<1	27.11	1.14	27.51	4.61*	17.58	6.68*	16.17	1.02	11.86	<1	4.18	<1	2.68	<1
D×S	9	10.40		20.25		25.84		11.77		49.33		9.85		25.15		24.07	
I×S	3	9.29		87.35		16.68		7.54		16.33		.73		159.64		52.56	
I×D×S	9	32.31		24.34		5.97		2.63		15.86		24.24		25.07		24.39	
Within Cells	32	1.78		1.25		1.05		.72		2.53		1.45		1.67		2.39	
Total	63	29.12		28.22		13.58		5.98		20.38		22.40		23.65		17.11	

†$F = ms_I / ms_{I \times S}$, $F = ms_D / ms_{D \times S}$, $F = ms_{I \times D} / ms_{I \times D \times S}$, where I refers to inflection, D refers to duration, and S refers to speakers.

*Significant at 5% level.

**Significant at 1% level.

TABLE 3. Analysis of variance of the main effects and interactions for inflection, context, and speakers.

Source of Variation	df	[e] Mean Square	F†	[a] Mean Square	F	[ɔ] Mean Square	F	[o] Mean Square	F	[ɛ] Mean Square	F	[ɪ] Mean Square	F	[ʌ] Mean Square	F	[ʊ] Mean Square	F
Context	2	784.64	42.64**	108.25	6.41*	15.75	1.06	18.19	9.68*	5.64	<1	101.40	4.32	15.44	<1	.27	<1
Inflection	1	13.02	16.28*	3.00	<1	16.33	<1	30.08	10.70*	21.34	5.13	9.19	<1	6.75	<1	27.00	4.72
Speakers	3	21.52		8.47		53.42		6.28		26.06		7.02		43.56		17.25	
C×I	2	8.52	4.53	3.25	<1	44.50	1.66	2.14	1.20	33.40	1.30	23.69	<1	.44	<1	.82	<1
C×S	6	18.40		16.89		14.92		1.88		25.95		23.48		23.68		5.44	
I×S	3	.80		69.83		67.78		2.81		4.16		24.07		71.64		5.72	
C×I×S	6	1.88		21.83		26.72		1.78		25.65		30.66		15.50		4.53	
Within Cells	24	.90		1.67		2.38		.33		1.42		1.73		1.00		2.25	
Total	47	38.50		15.60		16.96		2.72		11.35		15.28		14.00		4.51	

†$F = ms_I / ms_{I\times S}$, $F = ms_C / ms_{C\times S}$, $F = ms_{C\times I} / ms_{I\times C\times S}$, where I refers to inflection, C refers to context, and S refers to speakers.

*Significant at 5% level.

**Significant at 1% level.

interesting differences in recognition scores among at least some of the experimental conditions.

For all but the vowels [i u æ ɝ], for which listeners made very few errors under any condition, two three-way tables were set up in a factorial design for testing the significance of the differences in recognition scores for the various conditions studied.

Tables 2 and 3 present the results of the statistical analysis for the remaining eight vowels. These tables present, for each vowel tested, the possible sources of variation present in the three-way tables, together with the degrees of freedom available for their evaluation, the obtained mean squares, and the appropriate *F*'s. *F*'s which attained significance at the five per cent level of confidence and at or beyond the one per cent level are indicated.

For the table in which comparisons were made of the variances resulting from duration, inflection, and speakers (Table 2) analysis yielded the following results:

1. The variability resulting from repeated playings of the same recorded vowels was small in all cases, indicating that only a small amount of experimental error was associated with the listening process.

2. The triple interaction variability was large but Bartlett's (χ^2) test for homogeniety of variance among certain two-factor interactions showed no significant heterogeneity. The magnitude of such variability indicated, however, that considerable error may have been associated with the speaking and recording process.

3. Speaker variations were observed to be large, indicating that despite the controls used to obtain standardized vowel phonations, recognition scores tended to vary considerably from speaker to speaker.

4. Differences in recognition attributed to the inflection variable were found to be significant for [ɪ] above the one per cent level of confidence and for [e] between the five and ten per cent levels of confidence. In both cases the inflected vowel was recognized a greater number of times than the non-inflected vowel.

5. Differences in recognition attributable to the duration variable were found to be significant for four vowels. The direction of the differences indicated that [e] and [ɑ] were more likely to be correctly recognized at the longer than at the short durations, while [ɪ] and [ʊ] were significantly more often recognized at the shorter durations.

For the table in which comparisons where made according to inflection, context, and speakers (Table 3), the analysis of variance revealed the following:

1. As in the preceding analyses, the 'test-retest' reliability appeared to be good in all cases.

2. Triple interaction was large for all vowels except [e] and [ʊ]. As in the preceding case, however, this finding appeared to be of doubtful significance.

3. Speaker variations were again observed to be large.

4. Variation attributable to inflection appeared to be significant for [e] and [o], with the inflected conditions receiving the highest recognition scores.

5. Variation attributable to context was significant for [ɑ], [o], and [e] with context ([t]-[p] and 'isolated') conditions receiving the higher recognition scores.

Further information on the relation between vowel recognition and duration was obtained from analysis of the influence of duration on the *type* of error-substitutions made by the

TABLE 4. Analysis of the influence of duration on the type of error-substitution for all speakers combined.

Vowel Stimulus	*Duration*	*Error Substitutions* [ɪ] *n**	[ɪ] *p*†	[e] *n*	[e] *p*	[æ] *n*	[æ] *p*	*Others* *n*	*Others* *p*
[ɛ]	.08	55	.19	0	.00	1	.00	3	.01
	.2	5	.02	3	.01	27	.09	4	.01
	.5	2	.01	6	.02	45	.16	8	.03
	8.0	1	.00	32	.11	96	.33	0	.00
		[ʌ]		[ɔ]				*Others*	
		n	*p*	*n*	*p*			*n*	*p*
[ɑ]	.08	185	.64	5	.02			2	.01
	.2	81	.28	6	.02			1	.00
	.5	39	.14	12	.04			0	.00
	8.0	26	.09	15	.05			0	.00
		[ɪ]		[ɛ]				*Others*	
		n	*p*	*n*	*p*			*n*	*p*
[e]	.08	196	.68	64	.22			4	.01
	.2	98	.34	98	.34			7	.02
	.5	27	.09	102	.35			7	.02
	8.0	24	.08	72	.25			7	.02

*n = number of errors.
†p = proportion of errors to the total number of 288 judgements at each duration.

listening panel. It was found that even in cases where the total number of errors was not changed substantially as a result of changes in duration the kinds of errors made seemed to have been affected. It was noted that 'short' vowels tended to be incorrectly substituted more often at the short durations than at the long. Table 4 constitutes an error analysis of three vowels, chosen, in this instance, to be illustrative of the trend found in all eight of the vowels for which extensive analyses were made.[1]

In Table 4 the data for all speakers are combined. A tendency for type of error to be associated with duration can be seen. For [ɑ], to take an example, the [ʌ] errors decrease as stimulus duration increases, while the [ɔ] errors increase. In almost all cases it was found that when an incorrect response was made to a stimulus sound of short duration the substituted sound was likely to be one of the 'short' vowels, i.e., one of those vowels which have been reported by Black (*1*) and by Parmenter and Treviño (*7*) to be typically spoken with a short duration.[2] On the other hand,

[1] Complete tabulations have not been included because of space limitations. More complete data may be found in the original dissertation, on file in the library of the State University of Iowa. The author will gladly supply missing details upon request.

[2] The work of these investigators appears to make it possible roughly to order vowels with reference to their 'natural' or habitual durations in speech.

when the stimulus sound was of longer duration (with reference to the four conditions of 'segmented' duration) the substituted sound was more likely to be chosen from among those vowels habitually spoken as 'long' vowels. This kind of influence of duration on type of substitution was noted for all eight of the vowels analyzed. While the complexity of these data has made statistical analysis an extremely difficult if not questionable procedure, the magnitude of the differences involved seems to preclude at a 'common sense' level of confidence the possibility that the results are to be attributed to chance alone.

Discussion

Although the experimental results of this study were obscured to some extent by the large errors attributed to the speaking and recording process, there appeared to be a distinct possibility that in certain vowels inflection contributed additional cues useable by the listener in phonemic identification. The precise nature of these cues is, of course, still not clear. There are at least two possibilities: (1) a difference in fundamental frequency alone, with the shift in stimulation pattern along the basilar membrane providing the additional information concerning the characteristic vowel resonances; or (2) changes other than fundamental frequency which tend to occur concomitantly with a pitch inflection, where the additional items of information are supplied by changes in harmonic composition.

If some vowels are as unstable as they have appeared to be in the present study it may be that very slight alterations of vowel quality can produce marked changes in recognition scores. The realization of this makes the assumption of phonemic stability over the entire length of a two-tone to five-tone inflection seem somewhat less tenable than has been supposed.

Taylor's (*12*) principle of 'dynamogenetic irradiation' may account for a sufficient amount of instability in harmonic composition, or 'diphthongization,' of the inflected vowel to provide additional cues to vowel recognition. Taylor found the 'high' vowels (with regard to tongue position) to have higher natural frequencies and hypothesized that this was caused by irradiation of tongue tension to the vocal cord musculature. Conversely, it may be possible that the increased muscle tensions associated with a rise in pitch could tend to diphthongize the inflected vowel toward the high side of the vowel diagram. Inasmuch as most vowels in speech are inflected (though of course not always with rising inflections) such diphthongization may characteristically provide information for the evaluation of the phoneme.

Insofar as phonetic context is concerned, although recognition scores for some vowels in a [t]-[p] environment were lower than expected there did appear to be a tendency for them to be recognized correctly in a higher proportion of instances than was the case for the non-context vowels. The implication would seem to be that while semantic context may be required for 100 per cent indentification the 'natural' changes throughout the duration of a vowel in phonetic context—changes which were presumed to have been largely eliminated in the vowel segments—are also of some importance in phonemic identification. At least this seems quite likely to be the case under the particular conditions of this study for [e ɑ o].

The fact that the two vowels which had the highest mean squares for context, [e] and [o], are often diphthongs in contextual speech, would seem to make plausible the hypothesis that when vowel segments are taken in such a way as to eliminate the usual periods of onset and termination of the vowel, the degree to which listeners will tend to make errors in identification will depend upon the degree to which the vowel is normally diphthongized in speech. Further study seems indicated.

The results of the duration analyses of this study make it appear likely that duration has phonemic value. From the standpoint of recognition scores phonemic changes may occur as a result not only of changes in harmonic composition, but also of changes in the temporal characteristics of the vowel. Insofar as such differences in recognition as have been found can be charged to the alteration of the duration variable, it becomes difficult to justify the physical specification of the vowel solely in terms of a single time-slice analysis.

The consistency with which the results of the duration studies of Black (*1*) and of Parmenter and Treviño (7) have been borne out by the present study appears remarkable. Both Black's and Parmenter and Treviño's measurements would seem to show that [ɑ ɔ e o] are long vowels and that [ɛ ʌ ɪ ʊ] are short vowels from the standpoint of 'natural' duration in speech. That this concept of 'naturalness' can be quantitatively demonstrated as related to per cent recognition has been shown in the present results. In the effects of duration on recognition the results for the two groups of vowels have been almost diametrically opposed, the short vowels being more consistently identified at the short durations and the long vowels more consistently at the long durations.

The information obtained from this study would seem to indicate some rather interesting facts concerning the instability of the various phonemes. Apparently some vowels are much more stable than others—are, in some fashion, more distinctive as phonemes. Notable examples of stable vowels were [æ ɝ u i]. On the other hand, [ɛ ɪ ʌ ɔ] were among those mis-identified by a surprisingly large number of listeners.

Since completion of this study a report by Peterson and Barney (*8*) has substantiated some of these findings on vowel stability. Using a somewhat different method of vowel presentation they report the same vowels [i ɝ æ u] as giving the highest observer agreement. In explanation they conclude that 'certain of the vowels are generally better understood than others, possibly because they represent "limit" positions of the articulatory mechanisms . . .' They also point out, however, that the listener's 'language experience . . . influences both his speaking and his hearing of sounds.'

Whether the explanation of this variability in vowel identification be in the physical characteristics of the vowels or in semantic or learning aspects from the listener standpoint, certain vowels do appear to be more distinctive than others at suprathreshold levels of intensity. A realization of this fact should prove important in future phonetic research and may have immediate practical application in the teaching of the hard of hearing.

Perhaps more interesting than the data indicating that vowels vary in distinctiveness is the data indicating

the absolute size of some of the recognition scores obtained. For some conditions cases were numerous where less than 50 per cent identification was obtained for a given phonation—and this for phonemes which were supposed to have been carefully standardized. It is obvious that such a standardization of phonemes is a much more difficult task than might be supposed. These results would appear to throw open to question some of the information obtained by physical analyses of a few isolated examples of 'speaker-determined' phonemes.

In an experimental study of the relative identification thresholds of nine American vowels, Curry (*2*) reported 100 per cent supra-threshold identification for each of nine vowels in a [t]-[p] context. It seems unlikely that differences in speaker skill, listener training, or transmission fidelity could have accounted for the noticeably different results obtained in this study for some of the vowels in the same phonetic environment. What, then, has accounted for this difference? A possible explanation is the effect of position and number. In the present study there were 12, rather than nine vowels ([e o ɚ] were not included in the Curry study). Probably of more importance is the fact that in the present study the context vowels were scattered at random throughout a series consisting of vowels of different durations and inflections. It seems reasonable to suspect that this fact may have accounted for the differences, i.e., there may have been certain position effects acting to influence the vowel recognition scores. It would seem advisable to take account of the effects of position on recognition in further studies of this nature.

In an investigation of the intelligibility of 10 'long sustained' vowels, Siegenthaler (*11*) reported the overall score for four speakers as 52.4 per cent correct identification. Although a comparable analysis of the *eight-second* vowels of the present experiment yields a considerably higher score, Siegenthaler's data would seem to be confirmatory evidence for an instability in randomized, non-context, vowel identification. The discrepancy in total score can possibly be explained on the basis of the different equipment used in the present study as well as on the different method of presenting the 'sustained' sounds.

Considerably more research is indicated before the precise role of temporal factors in phonemic identification is known. Especially important is the question of the kind and extent of speaker variability. The role of variations in phonetic context and inflection would also seem to require further investigation in a more rigorous fashion than has been possible under the restrictions of the present experimental design. If the use of the human voice is contemplated in such investigations, the results of the present study make it clear that a fairly large sample of speakers is to be required if stable data are to be obtained. For the investigation of pitch modulation, in particular, the use of an artificial larynx such as the electrical vocal tract designed by Dunn (*3*) recommends itself as being well suited to experiments requiring precise control of the vowel stimulus.

Summary

The purpose of the present study was to investigate the possible influence on vowel recognition of certain cues which may be present in connected speech, but which are not

considered in a cross-sectional analysis of the acoustic spectrum of a vowel. The specific cues which it was desired to investigate were those which it was thought might result from: (1) modulation of fundamental frequency; (2) variation in duration; and (3) variation in the onset and termination characteristics of the vowel phonation. It was thought that a determination of the contribution to recognition of such cues would provide information concerning the extent to which the variations inherent in the contextual speech pattern are required for a complete specification of the physical characteristics of distinctive vowel phonemes.

Controlled phonations of the 12 commonly distinguished vowels of the General American dialect were obtained from four trained speakers to produce a set of tape recorded stimuli which were varied experimentally with respect to duration, phonetic context, and inflection.

These tape recorded vowel stimuli were edited, randomized, and presented to 18 trained listeners at a level 60 db above threshold in a sound isolated room over high quality reproduction equipment. The responses of this listening panel seemed to make possible certain tentative conclusions with regard to the problem of vowel recognition:

1. Vowels may differ markedly in the relative ease with which they are identified, i.e., in what might be termed their perceptual distinctiveness, at supra-threshold levels of intensity. The present study gives some basis for ordering vowels in this fashion. Although no strict ordering, as such, has been attempted for all vowels, [u i æ ɝ] appear as decidedly more distinctive than, for example, [e ʌ ɔ ɪ].

2. From phonation to phonation the vowel phoneme may be considerably more 'unstable' than has heretofore been supposed. At least such a conclusion would seem to follow from the fact of certain large variations found in the present study.

3. Pitch modulation may be a significant contributing cue to the recognition of certain vowels. Although the present evidence is somewhat equivocal on this point and does not allow for generalization of conclusions over all vowels, speakers, and conditions of duration or context, some of the tendencies of the data in that direction appear to be fairly consistent.

4. Insofar as phonetic context can be said to provide characteristic periods of onset and termination to the vowel, and insofar as these are lacking in a vowel segment from which the beginning and ending portions have been cut, the present data may indicate that such characteristic variation throughout the length of the vowel in phonetic context may provide significant cues to vowel identification. Although statistically significant differences were few, their appearance in three vowels, along with similar tendencies for most other vowels, would seem to lend some support to this view.

5. It appears likely that vowel recognition varies as a function of duration, in ways which depend upon the 'natural' or habitual durations of vowels in speech. This study seems to have supplied evidence for saying that the nearer a given vowel is to its 'natural' duration the better will be the recognition for that vowel. In other words, duration may have phonemic value.

In conclusion, the evidence herein presented would seem to indicate that for a complete specification of the

spoken vowel not only must there be provided the information about its energy-frequency distribution at a given instant in time, but also there must be provided certain items of information concerning the way in which it varies in the contextual speech pattern. As to the more precise nature of these items, additional research is needed.

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Notices

Fellows of the American Speech and Hearing Association are invited to submit nominations for the Fellowship to the Committee on Honors before the November convention. In considering possible names for nomination, Fellows should refer to the 'Definition of Fellowship' which appeared in the March, 1952, issue of the *Journal of Speech and Hearing Disorders*, page 105. Nominations should be sent to the chairman, Margaret Hall Powers, 228 North LaSalle Street, Chicago 1, Illinois.

According to Article X of the ASHA By-Laws, any Member, upon attaining the age of 65, may apply for and automatically receive Honorary Life Membership with all privileges of a Member. Annual dues will be waived. Applicants for Honorary Life Membership should write to George A. Kopp, Chairman of the Committee on Membership, Speech and Hearing Clinic, Wayne University, Detroit, Michigan.

ASHA has reprinted all out-of-stock issues of its *Journal*. Complete sets of the *Journal* or individual issues may be obtained from the Secretary-Treasurer. The price of the *Journals* is $3.00 per year for 1936-1946 and $3.50 per year for 1947 to the present. An additional 50c charge per year is requested for all foreign mailings. Single issues sell for $1.00 per copy.

Letter To The Editor

SIR:

In the last issue of the *Journal* was the article 'Speech Correction in the Pre-Association Era.' Herein, I found no mention of, and in Dr. Kester's Ph.D. dissertation on the same subject only casual comment on, the pioneering role that the city and teachers of Detroit played in the development of speech correction programs in the public schools of this country.

I am sure these oversights are in no way intentional. Information on this subject is not readily available. We in Detroit are very proud of our city's early beginnings and growth in public school speech correction services, however, not only because it was one of the first metropolitan centers to institute such a program, but because it played an important role in early research, experimentation and development of methodological techniques which are a great part of today's knowledge.

In the following paragraphs, I shall attempt to summarize the information outlining Detroit's early start.

On page 225 of the Annual Report of 1909-1910 of Wales C. Martindale, Superintendent of Schools, we find among the Board Proceedings, the following:

> From time to time it has come to my notice that pupils in the different schools stammer. Measures have been taken at different times to correct individual cases. So many cases have been called to my attention of late that I was determined to make a canvass of all the pupils in the public schools. Reports show that there are 247 cases. Some measure should be taken to correct the defective speech of these pupils. There are several ways in which remedies may be applied; however, the entire matter should be carefully discussed and considered before deciding which measure is the best to adopt. Very few of the pupils afflicted are even able to have the defect cured through private instructions and it would seem that attention given to this matter would not only be of personal benefit to the individual, but to society as a whole.

From this initial statement by Superintendent Martindale grew a series of recommendations and actions until on page 35 of the 1910-1911 Annual Report is to be found the following succinct statement:

> I respectfully report that rooms for correction of defective speech have been opened in the Harris School with Miss Lillian Morley, . . . in charge, and in the Wilkins School with Miss Clara Stoddard, . . . in charge.
> *Concurred in September, 1910.*

From the 69th Annual Report of the Board of Education, of the year ending June, 1912, pp. 123-124:

> The Schools for Stammerers, which are quite unique in purpose, and, with possibly one other, the only schools of their kind in connection with a public school system in this country, have completed the *second* successful year of their existence. These schools . . . minister to the needs of the children of the western and eastern sides of the city, respectively. Pupils in the public schools afflicted with stammering . . . are sent to them for two half-days a week until they are discharged. The length of time they need to overcome their defect depends upon the degree of the defect, and upon the ability and willingness of the pupil to carry out the instructions of the teacher. On the other hand, scores of parents whose children benefited by their attendance at the Schools for Stammerers, have expressed gratification at the results accomplished.

Gleaned from the statistical analysis included in this 1912 Report is the fol-

lowing summary:

> Total number different children enrolled in both rooms in *two* years' existence:.....168
> Total number discharged in two years: 49

In each of the next several years' Annual Reports appear both prose and statistical summaries of Detroit's work in speech correction – and of the growth of what was to become today's Detroit Speech Correction Department.

It is significant that many of the practices and much of the theory of modern speech correctionists has been for so long a part of Detroit's system. For instance, in the Annual Report of 1914, in addition to the announcement that two additional schools had been receiving speech correction service and that three more were expecting it, the following is to be noted:

> Seventy homes have been visited and parents given instructions by which they may assist in the correction of speech defects. 112 parents have visited these rooms [in the schools].

Also mentioned is the great cooperation and integration received from the school nurses, contributing orthodontists and oral surgeons and physicians.

Thus, we find that 40 years ago, Detroit was already recognizing those principles which are stressed so much today: the need for enlistment of the cooperation and services of not only the home but of all those concerned (orthodontists, physicians, dentists, psychologists, etc.) with the health and welfare of children.

In these and succeeding Reports are to be found descriptions of the methods and mechanics of organizing, administering and handling speech correction classes; the research and experimentation with diet; the relationships between physical, organic and/or neurological defects to speech defects.

I don't think it is necessary to go into discussion of the research done and the philosophies derived therefrom, or the characteristics and traits of speech defectives–all contained in these Annual Reports. These, and the statistics indicating the growth of the Detroit Speech Correction Department, are to be found throughout the years from 1910 until the present day. Also worthy of comment, are the numerous publications authored and published by our Department through the years which are still being used, such as Stoddard's *Sounds for Little Folks*, our Handbook, and many others.

We are much indebted not only to Clara Stoddard and Hildred Gross, past and present supervisors, respectively, but to those teachers who preceded us, who contributed so much to a program of speech correction in the public schools in the way of research and experimentation, and development of methodologies and techniques.

Finally, I am sure that had Professor Moore and Dr. Kester found this information available, they would have been the first to appreciate and publicize the significant facts of Detroit's pioneering efforts from its beginnings in 1910, with two teachers in two schools, through the decades of research, development and experimentation to its present staff of 50 speech correctionists and annual contact with over 11,000 cases.

THEODORE MANDELL
Detroit Public Schools

Book Reviews

VAN RIPER, CHARLES. *A Case Book in Speech Therapy*. New York: Prentice-Hall, Inc., 1953. Pp. 141. $2.75.

The writing of this book combines the excellences of the *New Yorker* style with the arresting aliveness of a good quiz program. In addition to being interestingly and skillfully written, it also has the very serious purpose of bridging the gap between theory and practice in speech therapy. As such, it marks something of a major step in the teaching of speech therapy. We have all recognized the difficulty in making the transition from theory to practice. It is the author's hope that this workbook will help to eliminate some of the confusion and fumbling on the part of the clinician and will also save the child, whom he is trying to help, from being hurt. (It should also be a great help to the supervisor and clinic director in organizing some of his activities.)

The case method is not new in speech therapy, but it is usually more anecdotal than problem-solving. In this book the case method has been used, as in law, medicine, and sociology, to present students with a case and the problems involved. Rather than a series of unrelated problems that could be illustrative of those commonly faced in practical speech therapy, this text presents an actual case (a nine-year-old girl with a serious articulatory handicap) with the problems integrated about it. According to the author, the factual material and the general course of treatment are authentic. He states further that the entire case was handled by students majoring in speech correction, and that it was supervised by the author. Much of the material was recorded. It is this authenticity which has heightened the value of the book. The mistakes were included as well as the successes. Usually clinicians have reported their handling of cases with an almost God-like wisdom. The one-sided nature of these pictures has often served to confound those humble clinicians who were only too aware of their human fallibility.

Perhaps the greatest contribution of the book is that in the process of being led step-by-step through examination, diagnosis, and therapy of a specific case, the student may gain as much as he is ready to receive, be aware of the breadth of the problem and surrounding factors, and not be overwhelmed by mountains of theory. The teacher who takes a single course will be cautioned without being frightened; and the advanced student will find that his greater knowledge will permit him to read with much more insight and profit. In either case, the student will be challenged by the good common sense and imaginative resourcefulness that can be used in handling a child when the handling clinician has an understanding of sound principles.

WILLIAM B. MCCOARD.
University of Southern California

ANDERSON, VIRGIL A. *Improving the Child's Speech*. New York: Oxford University Press, 1953. Pp. 333. $4.00.

This book was written for the classroom teacher with the thought that other non-specialists in speech correction might also find it useful. Recognizing the limitations of non-specialists in dealing with certain types of complicated disorders, the author has informed the reader of what he should not do in certain situations, and where he should turn for outside help. The major content of the book is concerned with the simpler speech problems that are likely to be remediable in the classroom by informed teachers. These problems include, according to the author's estimate, about 75 per cent of all the speech defects found among school children.

Contrary to the suggestion in the title, this is not a 'speech improvement' or a general speech book. While speech education as well as re-education is stressed, the book emphasizes mainly the voice and articulation problems of children and the personality difficulties that often surround them.

The college courses for which this book is designed will naturally vary widely as to length, content, and purpose depending upon local circumstances. Some instructors doubtless would prefer a more specific,

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Book Reviews is edited by Kenneth Scott Wood, University of Oregon.

how-to-do-it type of book, while others might desire more content on certain aspects of the subject than is contained in this book. The author has not tried to satisfy all the possible needs, but has taken a middle course. He has included what appears to be an adequate discussion of fundamental principles, theory and general procedures, as well as a sufficient amount and variety of specific techniques, practice exercises and diagnostic devices. A welcome feature is an entire chapter devoted to practical suggestions for integrating speech correction with daily classroom teaching.

Chapter headings are: *Speech Improvement as an Educational Problem, The Nature and Development of Speech, Recognizing Speech Disabilities, The Child and His Personal Problems, The Child with Delayed Speech, Articulation Disorders, Substandard Speech, Nasal Speech, Vocal Disorders, The Child Who Stutters, The Child With a Hearing Loss,* and *Integrating Speech Training with the School Curriculum.* A well selected list of references accompanies each chapter. Instructors desiring an extensive treatment of phonetics, anatomy of the speech mechanism, the physics of sound, and the more serious speech disorders will need to supplement the textbook content.

The book is authoritative and well written. It promises to be welcomed as an addition to the limited number of speech correction books written specifically for classroom teachers.

ERNEST C. FOSSUM.
Iowa State Teachers College

GOTTLOBER, A. B. *Understanding Stuttering.* New York: Grune and Stratton, 1953. Pp. 274. $5.50.

This book is intended to be a first aid manual for stutterers and to provide understanding and help for those 'stutterers, beginners and old-timers, to whom care has not been available, for their relatives and friends and, to some extent, for parents of potential stutterers.' This reviewer feels, however, that this book, with its comprehensive description of stuttering from a commonly accepted eclectic point of view, will prove more adaptable and serviceable as a supplementary text for students in speech correction. With its liberal references to case experiences and its worthwhile attempt to reconcile conflicting emphases and schools of thought, this book should help to broaden and orientate the student's understanding of stuttering.

Stimulating chapters include those on the precipitation and growth of stuttering and on the role of parents in matters relative to discipline, speech, and emotional security. A chapter on 'Personality Patterns Common to Blockers' covers such traits as perfectionism, projection, 'Cinderellaism,' 'ifism,' 'the chosen people,' the need for 'wailing walls,' 'the single package,' 'stumping the experts,' and pessimism. Although the contents of such chapters do explain trends which may often accompany stuttering, the author's wordy style, negative approach and technical terminology may limit reception by parents and unguided stutterers.

An outline of therapy covers education, reconditioning, relaxation and psychotherapy. A good evaluation is made of such therapeutic procedures as speech patterns in the reconditioning process, faking, self-rating, and the elimination of ineffective devices of stuttering. An eclectic point of view is taken showing how psychotherapy and symptomatic reconditioning can be integrated and so facilitate each other in therapy. Except for the chapter on relaxation, the discussions on therapy appear to be directed more to professional readers than to parents, stutterers and amateur therapists.

This book, recommended by the reviewer as a reference to help orientate students of stuttering, provides an additional bibliography of 80 suggested readings.

GEORGE O. EGLAND.
Childrens Hospital School
Eugene, Oregon

MANDL, MATTHEW. *Hearing Aids: Their Use, Care, and Repair.* New York: The Macmillan Co., 1953. Pp. 169. $3.50.

The author and publisher of this little book are to be commended for their temerity in venturing into this relatively virgin territory of literature, rather than for their accomplishments. The main difficulty with the book is that it was written by a technical consultant in radio and television who does not have experience with the special requirements of hearing aid design and performance, and who is obviously unfamiliar with the medical and psychological problems of the hearing aid user. His discussion of types of deafness, audiometric tests, and adaptation of the user to his aid contains such gross inaccuracies that it is doubtful if any professional person will find this book an 'invaluable reference,' as the author claims in his preface. It is regrettable

that he did not seek professional advice in writing these sections, or that the publisher did not require a critical reading of the manuscript by a professionally qualified audiologist.

Even in the sections dealing with technical aspects of hearing aids, the book would have gained if it had received a critical reading before publication. For example, in his discussion of hearing aid components, the author implies that crystal receivers and magnetic microphones are in wide current use. He assumes, with no suggestion that anyone will disagree, that hearing aids should provide selective amplification according to each user's individual requirements. Though transistors are mentioned briefly (under the heading 'Future Trends'), no mention is made of the use of compression amplification in modern aids.

It is difficult to see that this book has contributed anything of significance.

HAYES A. NEWBY.
Stanford University

FRANKEL, GEORGE W. *Let's Hear It! Confessions of a Hard of Hearing Doctor.* New York: Stratford House, 1952. Pp. 63. $1.00.

In this book Dr. Frankel tells of his frustrations resulting from a moderate hearing loss and how he was able to return to a more nearly normal life through the use of a hearing aid. He does not discuss the limitations of a hearing aid but gives the impression that it is a near miracle for anyone who will accept and use amplification. This publication serves a useful purpose in introducing the possibilities of the use of a hearing aid to the layman who will either not admit or not accept help for his subnormal hearing problem.

WILLIAM E. MILLER.
Institute of Logopedics

MACNUTT, ENA G. *Hearing With Our Eyes: A Lipreading Textbook for Teachers of the Deaf and Hard of Hearing Child with Manual for Accompanying Workbooks.* (Distributed by the Volta Bureau.) Boston: Ena G. MacNutt, 175 Dartmouth St., 1952. Pp. 147. $4.85.

This textbook is intended to offer material and lessons for the lipreading teacher of the advanced second through fifth elementary grades. Each 'lesson' forms a pattern comprised of sentence materials, a story, two games or 'devices,' periodic review, and workbook activity. A separate workbook is provided each student for recording correct answers by word underlining, numbering sentences, encircling words, filling blanks, etc.

The author succeeds, especially in the games and 'devices,' in presenting interesting and effective materials and ideas. The workbook experiment seems to have much intrinsic motivation and novelty, although its use requires at least third grade reading ability.

FRANK M. LASSMAN.
University of Minnesota

HOLLENDER, A. R., ED. *The Pharynx: Basic Aspects and Clinical Problems.* Chicago: Year Book Publishers, 1953. Pp. 560. $15.00.

In addition to the editor, 19 medical doctors contributed to this book. The first section of 118 pages discusses the anatomy of the mouth and pharynx, the physiology and pathology of the pharynx, methods of diagnosing pharyngeal disease, the bacteriology of the pharynx in health and disease, and roentgenographic examination of the pharynx.

The second section, consisting of 25 chapters, discusses the clinical problems in treating pharyngeal diseases. One chapter is devoted to the structure, function, and significance of the palatal uvula, and another to psychosomatic aspects of oral and pharyngeal disease.

This book should be of particular interest to advanced students of speech and hearing disorders because of its contribution in clarifying knowledge concerning the structure and function of the pharynx and related organs and because it throws light on how pharyngeal disease may affect speech.

KENNETH S. WOOD.
University of Oregon

MILLER, ELVENA. *Is Your Child Beginning to Stutter?* Seattle: Seattle Public Schools, 1952. Pp. 23. $.50.

This booklet was carefully thought out before it was written. Its purpose is to relieve the parents' fears about their nonfluent child by explaining what real stuttering is and by suggesting family influences that will help him gain fluency as he grows. The author discusses certain mistaken ideas

about stuttering and outlines some of the recognized psychological causes. A booklist for parent reading is given.

For an anxious parent this pamphlet would make an excellent place to start. It is clearly written, and the information is something every parent of a non-fluent child needs to know.

KENNETH SCOTT WOOD.
University of Oregon

BENDER, MORRIS B. *Disorders of Perception.* (American Lectures in Neurology, No. 120) Springfield, Ill.: Charles C. Thomas, 1952. Pp. 120. $3.00.

The title of this monograph is followed by the subtitle: *With particular reference to the phenomena of extinction and displacement.* The subtitle describes more accurately the content. The author, a neurologist, presents first a description of what he calls the method of simultaneous stimulation. A large part of the book is devoted to showing what kinds of sensory and cerebral defects can be uncovered through this method, even when they show no symptoms for single stimulation.

Briefly, a positive result with the method of simultaneous stimulation is shown when the perception of a stimulus is made to disappear (extinction) or to move (displacement) when a second stimulus is applied. Thus, in certain types of defects a stimulus in the right half of the visual field obliterates or displaces a stimulus in the left half that was perceived in the absence of the stimulus to the right half. Similar demonstrations are described in the stimulation of the skin. Not only does a stimulus on one side produce extinction or displacement of a stimulus on the other side, but also there may be dominance of one part over another part on the same side. Thus, a tactual stimulus applied to the hand will, in certain cases, be perceived unless it is applied at the same time as one is applied to the face. Then, only the one at the face will be perceived.

The author reviews various theories presented by his predecessors to explain such phenomena and seems most dissatisfied with the older explanation that was given in terms of simple inattention. The author himself presents no new theory that correlates any single general type of neurological disorder with extinction but rather analyzes the phenomena in a variety of types of patients. Some information is given on the occurrence of these phenomena in aphasics.

'Extinction is not a defect or a lack in function. It is a manifestation of a mode of interaction between two stimuli, especially when there is a gradient in the excitability of the sensory field.' Thus, the author concludes his series of observations on the phenomena. One cannot give a general evaluation of the book, for it combines phenomenal observations with fairly detailed case studies; and sprinkled among these observations are many speculative and theoretical statements, not all of which are as directly bound to the observed facts as they might be.

A bibliography lists 110 references in addition to a fairly complete index.

IRA J. HIRSH.
Central Institute for the Deaf

SARASON, SEYMOUR B. *Psychological Problems in Mental Deficiency.* (2nd ed.) New York: Harper and Brothers, 1953. Pp. 412. $5.00.

Dr. Sarason, associate professor of psychology at Yale University, has done a competent writing job in bringing together and evaluating the significant studies about the mentally deficient, especially those dealing with children. In this second edition, Dr. Sarason presents three new chapters dealing with the psychological aspects of the parental problem. These chapters are particularly valuable to those who work with mentally deficient children and with their mothers or fathers, who also present many a problem to society and to the psychologist.

Outstanding aspects of Dr. Sarason's book are his evaluation of the criteria of mental deficiency, his insistence that rigid classifications by I.Q. scores are unfair to those so classified, his handling of projective techniques and how they may be used with the feeble-minded, his constructive attitude toward psychotherapeutic techniques in helping the mentally deficient, and his analysis of the problem of institutionalization for the mentally deficient. This book should be helpful to almost everyone who deals with the mentally deficient—psychologists, psychiatrists, physicians, social case workers, educators, sociologists, and anthropologists.

Dr. Sarason includes a valuable bibliography and a good index.

JAMES F. BENDER.
National Institute for Human Relations

HAVIGHURST, ROBERT J. *Human Development and Education.* New York: Longmans, Green, and Co., 1953. Pp. 338. $4.00.

This is an enlarged revision of *Developmental Tasks and Education*, the author's earlier book. The material concerns education as related to the achievements of persons of various age levels of physical and mental abilities in learning. Two chapters are devoted to *Infancy and Early Childhood;* five to *Middle Childhood;* seven to *Adolescence;* three to *Adulthood and Old Age;* and the last two chapters to *An Empirical Study of Developmental Tasks in Middle Childhood and Adolescence.*

LINSKY, LEONARD, ED. *Semantics and the Philosophy of Language.* Urbana, Ill.: University of Illinois Press, 1952. Pp. 289. $3.75.

This is a collection of 14 original essays which have appeared in various publications, both American and foreign. They are of special interest to students of semantics and linguistic philosophy. The editor has brought together what he considers to be some of the classic literature from the field of philosophic semantics in an effort to put back into print articles from journals and books which are no longer obtainable. A variety of semantic topics are represented in the volume by such authors as Alfred Tarski, C. I. Lewis, Nelson Goodman, Bertrand Russell, Benson Mates, Willard Quine, and Carl Hempel.

FENLASON, ANNE F. *Essentials in Interviewing: For the Interviewer Offering Professional Services.* New York: Harper and Brothers, 1952. Pp. 352. $4.00.

The author's purpose was to show how knowledge drawn from the social sciences can be used in understanding and working effectively with people. The first two chapters discuss knowledge considered to be essential for the interviewer to have; the next two chapters discuss the interviewing method and attitudes in interviewing. The remainder of the volume contains material for class analysis and assignment.

HALL, W. AND MATHEWS, O. M. *Sound.* London: Edward Arnold and Co., 1951. Pp. 239. $1.75.

This elementary textbook on the physics of sound is illustrated with numerous diagrams and experiments explaining the nature of sound including propagation, velocity, reflection and refraction, interference and diffraction, stationary waves and the Döppler effect, measurement of frequency, the vibration of strings, and resonance. One chapter is devoted to ultrasonics and one to technical applications. Appended material discusses simple harmonic motion and the cathode ray oscillograph.

MURSELL, JAMES L. *Psychology for Modern Education.* New York: W. W. Norton Co., 1952. Pp. 610. $3.90.

The author's purpose in this work was to bring the content of educational psychology to focus on the proposition that the essential reality of education is the shaping of personality. Accordingly, the book treats the dynamic aspects of learning and motivation. The well-established topics of educational psychology, such as learning, transfer, and growth, are retained. The bibliography contains 758 items.

THURSTONE, L. L., ED. *Applications of Psychology.* New York: Harper and Brothers, 1952. Pp. 209. $3.00.

This is a collection of 11 psychological essays published in honor of Walter V. Bingham. Among the selections are *Creative Talent* by Thurstone; *Twenty-Year Follow-Up of Medical Interests* by Strong; *Validation of Measures of Interests and Temperament* by Guilford; *A Tool for Selection that Has Stood the Test of Time* by Bills; and *Use of Attitude Surveys in Personnel Practice* by Moore.

ROBINSON, HELEN M., ED. *Clinical Studies in Reading, II: With Emphasis on Vision Problems.* Chicago: University of Chicago Press, 1953. Pp. 189. $3.75.

This is the second of two monographs published in conjunction with the *School Review* and the *Elementary School Journal.* Based upon experience in diagnosis and remedial instruction of poor readers at the Reading Clinic of the University of Chicago, it contains reports of eight investigations made by the staff members and graduate students. Five papers dealing with children's visual adjustments are also included.

The editor of the monograph presents in the final chapter a summary of what she considers the most significant contributions

and implications of these findings and identifies areas for future research.

An appendix gives an annotated list of diagnostic tests, equipment, and trade books which may be used in a reading clinic.

EPHRON, BEULAH K. *Emotional Difficulties in Reading: A Psychological Approach to Study Problems.* New York: Julian Press, 1953. Pp. 305. $5.00.

This psychoanalytically oriented book seeks to clarify the role of psychotherapy in adolescent and adult remedial reading. The author presents a dialogue account of nine interviews with a 15-year-old boy and 39 interviews with a 20-year-old boy both of whom had been referred because of reading difficulty. Interpretative comments are given after each interview account. In addition, four initial interviews with adolescents are presented and analyzed for the purpose of showing 'underlying threads' which seem to appear.

In a chapter on *Orientation* the author discusses some of the 'threads that emerge from below the surface when reading problems are studied carefully,' and emphasizes that reading cannot be regarded as separate from the other behavior of an individual.

A bibliography of 76 entries is given.

GORLOW, LEON, HOCH, E. L. AND TELSCHOW, E. F. *The Nature of Nondirective Group Therapy: An Experimental Investigation.* New York: Teachers College, Columbia University, 1952. Pp. 143. $3.25.

This is a report of a cooperative investigation of the process of nondirective group psychotherapy in which a group of subjects was given certain psychological tests before and after the therapeutic experience. The study seeks to answer the questions: What characterizes nondirective group psychotherapy? When in the course of a group's activity do various features occur? Why do certain phenomena take place?

MERLOO, JOOST A. M. *Conversation and Communication: A Psychological Inquiry into Language and Human Relations.* New York: International Universities Press, Inc., 1952. Pp. 245. $4.00.

The author discusses conversation as it is related to the problems of human mutual understanding. From a linguistic, psychoanalytical, and social-psychological point of view he discusses such topics as emotional expression, gesture language, sound language, picture language, word magic and symbolism, semantics, the perversions of communication, the role of the unconscious, and the 'art of silence and listening.'

SHAFFER, G. WILSON AND LAZARUS, RICHARD S. *Fundamental Concepts in Clinical Psychology.* New York: McGraw-Hill Book Co., 1952. Pp. 540. $6.00.

The emphasis in this text for the student of clinical psychology is placed on theory and methodology. The first chapter is devoted to a brief survey of some of the main historical developments and a discussion of the current professional problems of the clinical psychologist. The second chapter deals with methodology in an effort to establish clear understanding of concepts and techniques. The next 13 chapters are given over to a critical review of the various problems of the clinician who is faced with the task of understanding and treating behavior deviations. The following are some of the major topics treated: *Clinical Techniques, Intelligence and Its Measurement, Defects of Intelligence, Nature of Personality, Introduction to Psychotherapy, Psychotherapeutic Devices, Psychoanalysis, Special Psychotherapies,* and *The Clinician in Action.* Over 800 entries are given in the the bibliography.

ABRAMSON, HAROLD A., ED. *Problems of Consciousness.* New York: Josiah Macy, Jr. Foundation, 1952. Pp. 156. $3.25.

This volume is an edited transcript of the Transactions of the Third Conference on Problems of Consciousness held in New York, March 1952. Seymour Kety introduced and lead the discussion on *Consciousness and the Metabolism of the Brain;* Lewis Wolberg discussed *Hypnotic Phenomena;* and Marcel Monnier conducted the discussion on *Experimental Work on Sleep and Other Variations of Consciousness.* Twenty persons participated in the discussion which is recorded in dialogue form.

SNYDER, F. W. AND PRONKO, N. H. *Vision with Spatial Inversion.* Wichita, Kan.: University of Wichita Press, 1952. Pp. 144. $2.00.

This is an account of an experimental study of the question: What happens in perception when the visual field is inverted? One subject was fitted with inverting lenses

and presented with a variety of tasks to perform which included card-sorting, manipulation, peg-boards, and mirror-tracing. Some of the subject's behavior was recorded by motion pictures. Observations were made in walking behavior, language behavior, several visual-motor activities, and auditory-visual conflicts. Control variables were observations of behavior before, during and after visual disorientation.

FERGUSON, LEONARD W. *Personality Measurement.* New York: McGraw-Hill Book Co., 1952. Pp. 457. $6.00.

This is a comprehensive discussion of 14 methodologies in personality test construction and the meanings of the measures which result from various types of tests. These methodologies include the following approaches: Empirical, rational, a priori, a posteriori, unidimensional, multidimensional, diagnostic, prognostic, non-analytical, analytical, perceptual, imaginal, observational, and experimental. A restricted list of references is given.

GUILFORD, J. P. *General Psychology.* (2nd ed.) New York: D. Van Nostrand Co., 1952. Pp. 587. $5.00.

The author has aimed his writing at the introductory course in the colleges of liberal arts. The second edition has shifted the emphasis to make the presentation more student-centered and less subject-centered. Of the 22 chapters, one is devoted to hearing, sound waves, attributes of sound, phenomena of sounds, the mechanism of hearing, and hearing as a space sense. Many suggestions for the application of psychological findings to the student's own life are given.

KRIEG, WENDELL J. S. *Functional Neuroanatomy.* (2nd ed.) New York: The Blakiston Co., 1953. Pp. 659. $9.00.

This revised edition has been made simpler by increasing the amount of basic anatomy and by the addition of nearly 100 new drawings and their explanations. The new drawings give special regard to third dimension and try to give the student a better picture of various sections. Beginning with the fundamentals of neuroanatomy and function, the author proceeds to the complex superstructure, from the primary neurons of the spinal nerves to those of the cranial nerves, from the sensory systems to motor pathways, from the cerebrum to the cerebellum. An atlas of sections, suggestions for further study, and an index add to the usability of this text. Emphasis is placed on the fiber architecture of the medullary centers of the cerebrum and cerebellum. One chapter is devoted to the vestibular system and one to the auditory system.

BARKER, ROGER G. AND OTHERS. *Adjustment to Physical Handicap and Illness: A Survey of the Social Psychology of Physique and Disability.* (Rev. ed.) New York: Social Science Research Council, 230 Park Ave., 1953. Pp. 456. $2.00.

This is essentially a survey of psychological research in the area of physical disability. It includes summaries and evaluations of various studies of the somatopsychological factors in individual growth differences, crippling, tuberculosis, impaired hearing and vision, and acute illness. The employment of the disabled is also discussed.

Eighty pages are devoted to *The Somatopsychological Significance of Impaired Hearing.*

GARRETT, JAMES F., ED. *Psychological Aspects of Physical Disability.* (Rehabilitation Service Series No. 210) Washington, D. C.: Office of Vocational Rehabilitation, Federal Security Agency, 1953. Pp. 195. $.45.

Written primarily for vocational rehabilitation counselors, this book aims to assist the counselor in planning better programs. Thirty-six pages are devoted to the problems of the deaf and hard of hearing. Psychological and psychiatric aspects of the blind and partially sighted, the cerebral palsied, the facially disfigured, the tubercular, and the paraplegic are among the topics discussed. Authors include Menninger, Barker, Wright, Berger, Rusk, and others of note.

Selected references are given for each type of disability.

Current Publications

ANDERSON, VIRGIL A. *Improving the Child's Speech.* New York: Oxford University Press, 1953. Pp. 333. $4.00.

BAKER, HARRY J. *Introduction to Exceptional Children.* (Rev. ed.) New York: Macmillan Co., 1953. Pp. 516. $5.00.

BARKER, ROGER G. AND OTHERS. *Adjustment to Physical Handicap and Illness: A Survey of the Social Psychology of Physique and Disability.* (Rev. ed.) New York: Social Science Research Council, 230 Park Ave., 1953. Pp. 456. $2.00.

BLUM, GERALD S. *Psychoanalytic Theories of Personality.* New York: McGraw-Hill Book Co., 1953. Pp. 237. $3.75.

BONNER, HUBERT. *Social Psychology: An Interdisciplinary Approach.* New York: American Book Co., 1953. Pp. 445. $4.25.

BUROS, OSCAR K. *The Fourth Mental Measurements Yearbook.* Highland Park, N. J.: Gryphon Press, 220 Montgomery St., 1953. Pp. 1187. $18.00.

CHARLES, EDNA N. *Understanding the Mind of the Young Child: An Introductory Course.* Dubuque, Iowa: W. C. Brown Co., 1952. Pp. 146. $2.75.

COLE, LAWRENCE E. *Human Behavior: Psychology as a Bio-social Science.* Yonkers, N. Y.: World Book Co., 1953. Pp. 884. $5.50.

COX, MARY A. *Teach Your Child to Read: A Book for Parents.* New York: Exposition Press, 1953. Pp. 39. $2.00.

CROCE, BENEDETTO. *Aesthetic, as Science of Expression and General Linguistic.* New York: Noonday Press, 1953. Pp. 533. $6.50.

CRUZE, WENDELL W. *Adolescent Psychology and Development.* New York: Ronald Press, 1953. Pp. 569. $5.00.

ECCLES, JOHN C. *The Neurophysiological Basis of Mind.* New York: Oxford Book Co., 1953. Pp. 324. $6.50.

EPHRON, BEULAH K. *Emotional Difficulties in Reading: A Psychological Approach to Study Problems.* New York: Julian Press, 1953. Pp. 305. $5.00.

FRANKLIN, R. H. *Surgery of the Aesophagus.* Baltimore: Williams and Wilkins Co., 1953. Pp. 222. $8.50.

GARRETT, JAMES F., ED. *Psychological Aspects of Physical Disability.* Washington, D. C.: Office of Vocational Rehabilitation, Federal Security Agency, 1953. Pp. 195. $.45.

GRASSI, JOSEPH. *The Grassi Block Substitution Test for Measuring Organic Brain Pathology.* Springfield, Ill.: Charles C. Thomas, 1953. Pp. 84. $3.00.

GRINKER, RAY R. *Psychosomatic Research.* New York: W. W. Norton and Co., 1953. Pp. 208. $3.50.

HAYMAKER, WEBB. *The Founders of Neurology: 133 Biographical Sketches.* Springfield, Ill.: Charles C. Thomas, 1953. Pp. 512. $10.50.

HOLLENDER, A. R., ED. *The Pharynx: Basic Aspects and Clinical Problems.* Chicago: Year Book Publishers, 1953. Pp. 560. $15.00.

Index to Dental Literature in the English Language. Chicago: American Dental Association, 1953. Pp. 231. $10.00.

KARPF, FAY B. *The Psychology and Psychotherapy of Otto Rank: An Historical and Comparative Introduction.* New York: Philosophical Library, 1953. Pp. 138. $3.00.

KESSLER, HENRY H. *Rehabilitation of the Physically Handicapped.* (Rev. ed.) New York: Columbia University Press, 1953. Pp. 288. $4.00.

LENDE, HELGA. *Books about the Blind: A Bibliographical Guide to Literature Relating to the Blind.* (Rev. ed.) New York: American Foundation for the Blind, 1953. Pp. 364. $5.00.

LINDQUIST, E. F. *Design and Analysis of Experiments in Psychology and Education.* Boston: Houghton Mifflin Co., 1953. Pp. 412. $6.50.

LINDQUIST, LILLY AND WACHNER, CLARENCE. *General Language: English and Its Foreign Relations.* (Rev. ed.) New York: Henry Holt and Co., 1952. Pp. 433. $2.76.

MITCHELL, G. A. C. *Anatomy of the Autonomic Nervous System.* Baltimore: Williams and Wilkins Co., 1953. Pp. 356. $10.00.

MOWRER, ORVAL H. AND OTHERS. *Psychotherapy: Theory and Research.* New York: Ronald Press, 1953. Pp. 718. $10.00.

OVERHOLSER, WINIFRED. *The Psychiatrist and the Law.* New York: Harcourt, Brace and Co., 1953. Pp. 157. $3.50.

PATTERSON, C. H. *The Wechsler-Bellevue Scales: A Guide for Counselors.* Springfield, Ill.: Charles C. Thomas, 1953. Pp. 154. $3.75.

PODOLSKY, EDWARD, ED. *Encyclopedia of Aberrations: A Psychiatric Handbook.* New York: Philosophical Library, 1953. Pp. 558. $10.00.

POWDERMAKER, FLORENCE B. AND FRANK, JEROME D. *Group Psychotherapy: Studies in Methodology of Research and Therapy.* Cambridge, Mass.: Harvard University Press, 1953. Pp. 630. $6.50.

REISS, SAMUEL. *The Universe of Meaning.* New York: Philosophical Library, 1953. Pp. 237. $3.75.

ROBBINS, FLORENCE G. *Educational Sociology: A Study in Child, Youth, School, and Community.* New York: Henry Holt and Co., 1953. Pp. 543. $4.75.

ROBINSON, HELEN M., ED. *Clinical Studies in Reading: With Emphasis on Vision Problems.* Chicago: University of Chicago Press, 1953. Pp. 199. $3.75.

SENN, MILTON J. E., ED. *Problems of Infancy and Childhood.* New York: Josiah Macy, Jr. Foundation, 1953. Pp. 160. $2.50.

SHOSTECK, ROBERT. *Career as a Speech Therapist.* Washington, D. C.: B'nai B'rith Vocational Service Bureau, 1761 R St., N.W., 1953. $.20.

SWENSON, GEORGE W., JR. *Principles of Modern Acoustics.* New York: D. Van Nostrand Co., 1953. Pp. 229. $4.00.

TEICHER, JOSEPH D. *Your Child and His Problems: A Basic Guide for Parents.* Boston: Little, Brown and Co., 1953. Pp. 310. $3.75.

THOMPSON, MARY M. AND SIMPSON, JEAN M. *Talk It Out With Your Child: Better Child Guidance Through Family Conversations.* New York: McGraw-Hill Book Co., 1953. Pp. 277. $3.50.

VAN RIPER, C. *A Case Book in Speech Therapy.* New York: Prentice-Hall, Inc., 1953. Pp. 141. $2.75.

WALTER, W. G. *The Living Brain.* New York: W. W. Norton and Co., 1953. Pp. 311. $3.95.

WARTENBERG, ROBERT. *Diagnostic Tests in Neurology.* Chicago: Year Book Publishers, 1953. Pp. 228. $4.50.

Abstracts

LORE, J. I. Speech and hearing therapy in Delaware. *Delaware Sch. J.*, 18, 1952, 8, 20.

A history of the development of speech and hearing therapy facilities in Delaware and a description of their current operation. (*J.M.*)

BOLAND, J. L. Speech therapy. *Okla. Teacher*, 34(4), 1952, 19-20, 31.

The author points out causes of speech disorders and indicates the role of the speech therapist and the teacher in meeting the needs of the speech handicapped school child. (*J.M.*)

MCCARTHY, D. Organismic interpretations of infant vocalizations. *Child Develpm.*, 23, 1952, 273-280.

'Detailed analysis of the child's prelinguistic utterances in terms of groups of phonemes has yielded marked developmental trends. Vowel development seems to be analogous to the gross motor development and consonant development to the individuation of specific finer movements essential for the pronunciation of real words.' The author integrates the facts of vowel and consonant development with the embryological development of the tongue. (*J.M.*)

Abstracts is edited by Jack Matthews, University of Pittsburgh, assisted by the following committee: Asa J. Berlin, Pennsylvania State College; Virginia B. Carroll, Minneapolis Veterans Hospital; Charles F. Diehl, University of Kentucky; James V. Frick, Pennsylvania State College; Inez E. Hegarty, Mt. Holyoke College; Lester L. Hale, University of Florida; Frank M. Lassman, University of Minnesota; Georgiana M. Peacher, Temple University; Sylvia O. Richardson, San Diego, Calif.; George H. Shames, University of Pittsburgh; D. C. Spriestersbach, State University of Iowa; Jesse J. Villarreal, University of Texas. The committee systematically reviews 203 journals for articles of interest to members of ASHA.

COHEN, L. Localization of the stretch reflex. *J. Neurophysiol.*, 16, 1953, 272-285.

The author reports very fine localization of the stretch reflex in quadriceps femoris in decerebrated cats under resting conditions. He also discusses the increased influence on the stretch reflex of 'face turned toward,' 'fast stretch,' and 'crossed extension.' (*V.B.C.*)

GORMAN, E. It takes more than skill. *Amer. J. Nurs.*, 53, 1953, 581-582.

The mother of a cerebral palsied child describes the guilt, failure and disappointment often felt by parents of a handicapped child and suggests how this problem may be met. (*J.V.F.*)

STROTHER, C. Realistic educational goals for the cerebral palsied child. *Crippled Child*, 30, 1953, 4-7.

The importance of realistic goals is stressed with the determination of the child's intellectual capacities singled out as the major problem. Planning will be most effective when the *pattern* of the child's intellectual abilities and disabilities is known. (*J.V.F.*)

Symposium: Counseling the mentally retarded and their parents. *J. clin. Psychol.*, 9, 1953, 99-124.

Five reports are presented on vocational placement, counseling, and parent guidance with the mentally retarded. Certain philosophies and techniques of counseling are given, specific programs for rehabilitation are outlined, and both individual and group parent counseling are discussed. (*V.B.C.*)

JOHNSON, T. E. Nasality in southern speech. *Sth. Speech J.*, 17, 1951, 30-39.

To assist in eliminating the confusion that seems to exist among speech teachers and textbook writers, the author of this article has answered three questions about nasality in the speech of the southerner.

First, he answers the query, 'What is it?', by defining nasality as excessive, unpleasant, or improper nasal resonance given to non-nasal sounds, chiefly vowels and diphthongs. Nasalization is differentiated from nasality, the former being the product of nasal resonance without reference to pleasantness or unpleasantness. When nasalization goes beyond the bounds of good usage, it becomes nasality.

The second question, concerning the causes of nasality, is answered by a listing of four possible precipitating factors—a relaxed velum, a raised but tensed velum, assimilation through the presence of adjacent nasal sounds, or a mechanism not as yet too well understood.

In response to the third question, 'How prevalent is nasality in southern speech?', the writer states that the problem is quite prevalent, but that further evidence about its incidence is needed. (*C.G.W.*)

BOLAND, J. L. Voice therapy for hoarse voice. *J. Okla. St. med. Ass.*, 46, 1953, 109-113.

'The number of persons who are treated for hoarseness is infinitesimal compared to the number of people who need treatment . . . Hoarseness is not confined to one personality type.' The author discusses causes of hoarseness and describes voice therapy. (*J.M.*)

GLAUBER, P. The treatment of stuttering. *Soc. Casewk.*, 34, 1953, 162-163.

A description of psychoanalytic therapy for the stutterer and his parents. (*J.M.*)

GOSS, A. Stuttering behavior and anxiety as a function of the duration of stimulus words. *J. abnorm. soc. Psychol.*, 47, 1952, 38-50.

This study is based upon two assumptions, (1) that the occurrence of overt stuttering is a function of the strength of an antecedent and/or concomitant anxiety state, and (2) that this anxiety is a joint function of word stimulus characteristics and speech situation variables. It undertakes to test the hypothesis that duration of stimulus influences the strength of anxiety and/or anxiety motivated behavior, and that anxiety previously established by recurrent momentary noxious stimuli rises to a maximum at a point in time coincident with the occurrence of the noxious stimulus, and then dissipates rapidly.

Two experiments are reported. In the first, 24 stutterers were required to say 24 words at each of four intervals (0, 1, 2 and 5 seconds) between exposure of the word on a drum and flashing of a light as a signal to say the word. In the second experiment, 19 of the original 24 subjects were given 12 words at each of six experimental time intervals (0, 1, 2, 4, 7 and 10 seconds). Three word-test trials were run for each subject.

The four resulting curves showed a downward-upward form. In each of them, frequency of stuttering was greatest at the 0 interval, decreased for 1 or 2 seconds, and subsequently increased out to 10 seconds. The decrease in stuttering between the 0 and 2-second intervals and the increase between the 2- and the 10-second intervals, were significant at the 5 per cent level of confidence. In the second experiment, adaptation occurred on the second and third word-test trials.

The author interpreted the initial decrease in stuttering frequency as a reflection of reduction in strength of anxiety following presentation of the stimulus word. He concluded that the time interval between response-cessation and appearance of the next stimulus word was also a source of anxiety, and that the increase in stuttering frequency between the 2- and 10-second exposure intervals could be best accounted for in terms of a gradual increase in anticitipatory tension or anxiety. (*H.M.S.*)

QUARRINGTON, B. The performance of stutterers on the Rosenzweig Picture-Frustration test. *J. clin. Psychol.*, 9, 1953, 189-192.

In 1952, Madison and Nelson compared stutterers and normal adults on the Rosenzweig Picture-Frustration Test and reported that stutterers showed a lower frequency of response in Extropunitive and Obstinate-Dominance categories and a higher frequency of response on Intropunitive. The author repeated this study with 30 adult stutterers and compared them with the normative findings. He reports he found no evidence to support the findings of Madison and Nelson. (*V.B.C.*)

LIPPITT, R. Role playing. *Amer. J. Nurs.*, 53, 1953, 693-696.

The author outlines the functions of role playing and advances several practical suggestions for its use. (*J.V.F.*)

DuPont, H., Landsman, T. and Valentine, M. The treatment of delayed speech by client-centered therapy. *J. consult. Psychol.*, 17, 1953, 122-125.

The authors report on an eight-year-old boy with delayed speech whose problem was believed based on feelings of rejection. Child-centered play therapy was employed for a year. The authors point out the value of treating certain delayed speech cases by child-centered therapy instead of speech-centered therapy. (*V.B.C.*)

Ammons, C. H. and Ammons, R. B. Research and clinical application of doll-play interview. *J. Personality*, 21, 1952, 85-90.

The methodology of the doll-play interview as it is related to research and clinical applications is discussed. (*D.C.S.*)

Berkley, W. T. The harelip-cleft palate problem. *N. Car. med. J.*, 14, 1953, 108-115.

A review of basic principles of management of hare lip and cleft palate patients. (*J.M.*)

Cleft lip and palate and parental age. *Dent. Digest*, 59, 1953, 221, 240.

The causes of cleft palate and harelip are examined for their research support. Age of parents, intrauterine exhaustion, dietary deficiency, communicable diseases and maternal impressions do not have as much research support as hereditary influences. (*G.H.S.*)

Westlake, H. Understanding the child with a cleft palate. *Quart. J. Speech*, 39, 1953, 165-172.

A description of cleft palate and its relation to speech and social problems. Contains information for the benefit of the non-specialist who may have occasion to associate with cleft palate individuals. (*C.F.D.*)

Howard, G. D. Restoring the lost vertical dimension of the cleft palate patient. *J. Amer. dent. Ass.*, 46, 1953, 404-407.

A description is given of the restoration of lost vertical dimension in cleft palate patients who have mutilated growth patterns subsequent to extensive surgery. In addition to masticatory difficulties, cosmetic, speech, and psycho-social problems can develop from growth mutilation. The technique for restoration involves a full denture fitted over the remaining maxillary teeth. (*G.H.S.*)

Carter, H. A. Rehabilitation of the hard of hearing. *Arch. phys. Med.*, 34, 1953, 224-227.

Distinction between deaf and hard of hearing is made and rehabilitation procedures for hard of hearing are outlined. Requirements for hearing centers and certification of hearing aid salesmen by Society of Hearing Aid Audiologists are discussed. (*J.M.*)

Cory, P. B. Deaf children see and learn. *Educ. Screen*, 32, 1953, 157, 165.

Author describes methods of using visual material, especially films and correlated books, in education of deaf children with little or no language. (*J.M.*)

Cutler, H. Otitis media. *Amer. J. Nurs.*, 53, 1953, 573-574.

The author, a physician, presents the pathology, diagnostic signs, and possible complications characteristic of this disease which has become a 'hospital curiosity.' (*J.V.F.*)

Meyer, M. Crucial experiments in cochlear mechanics. *Amer. J. Psychol.*, 66, 1953, 261-269.

Two experiments are presented to substantiate the hydraulic theory of cochlear stimulation. Two theorems derived from the data are given. (*V.B.C.*)

Dreher, J. J. and Bragg, V. C. Evaluation of voice normality. *Speech Monogr.*, 20, 1953, 74-78.

Regionally selected listeners were presented with an oral passage mechanically distorted in time, pitch, and quality. By adjusting the mechanical basis for the distortion, the listeners were asked to return the distorted voice to 'normality.' It was found that the listeners, as a group, could not agree when a voice was normal or time/pitch distorted if they were not acquainted with the voice. Alternate conclusions are presented. (*D.C.S.*)

News And Announcements

The Cleveland Hearing and Speech Center is opening this fall a new $450,000 addition to its present building on the campus of Western Reserve University. The addition will provide expanded diagnostic, therapeutic and research facilities for exceptional children in Cleveland and the northeastern Ohio area.

The basement floor houses the Kresge Hearing and Speech Research Institute which contains three floated, sound treated testing and control units for research in hearing aid evaluation, a radionics laboratory and auditory training quarters and testing facilities. On the first floor are administrative and therapeutic offices, with half of the floor space being devoted to the Harry F. Coulby Nursery for Deaf and Multiply Handicapped Children. The second floor provides numerous therapy rooms all of which have observation and listening facilities for demonstration and orientation of students, parents, and other visiting personnel. Also on the second floor will be a combined auditorium and recreational rehabilitation unit in which a television screen will permit controlled observation of cases being treated in any of the clinical facilities in the building. A unique feature will be a multiple recording console which will also enable therapists to utilize simultaneously the immediate recording and playback equipment from any therapeutic room. The third floor will provide a library, faculty, board room, a physiology laboratory, student-staff quarters and individual research units. The center is being furnished throughout with the latest equipment, and design in construction facilitates therapy for various age ranges and case types while providing maximal demonstration and teaching facilities.

The center's director, George J. Fortune, points out that this addition is part of a million dollar expansion program to enhance the services of the center and to provide training and teaching facilities for close integration of demonstration work and classroom education.

The Newark, New Jersey, State Teachers College now offers a master's degree in Special Education. Areas of specialization will include speech pathology, hearing impairment and mental retardation. The college, in cooperation with the rehabilitation center of the St. Barnabus Hospital in Newark, will sponsor a workshop in cleft palate starting in the fall of 1953.

The United Cerebral Palsy Association of Peninsula Cities, an affiliate of the Northern California Association, has established two clinical assistantships at the Stanford Speech and Hearing Clinic to provide for an intensive speech therapy program for preschool cerebral palsied children. The program began during the summer of 1953.

Temple University has expanded its Speech and Hearing Clinic to provide new facilities for teacher-training programs and research and an extension of this general service to the greater Philadelphia community. A cooperative program has been established with the Psychological Clinic, the Reading Clinic, the Testing Bureau, the Dental School, the Medical School and Hospital of Temple University. Murray Halfond has been appointed director of the new clinic facilities. The curriculum program has been expanded and new courses being offered include Auditory Training, Speechreading, Seminar on Speech Pathology and Audiology and nine project courses in various areas of speech disability and clinical practice. In addition, a new undergraduate curriculum is being organized in cooperation with the Department of Early Childhood and Elementary Education.

The Pennsylvania State College has been chosen as a location for one of four state audiology centers in Pennsylvania. These

News and Announcements is edited by Charles R. Elliott, Northwestern University, assisted by the following committee: Jane Beasley, University of Alabama; George Gens, Newark (New Jersey) State Teachers College; Elise Hahn, University of California at Los Angeles; Earl Schubert, State University of Iowa.

centers will provide special services in hearing examination and hearing aid selection in conjunction with special county therapists. Bruce Siegenthaler is the Chief Audiologist at the new center.

The Chicago Speech Therapy and Audiology Society's Directory for 1953 contains it's recently-adopted 'Principles of Ethics,' a detailed code devised for the specialized problems of the area, which was prepared for the Society by Paul D. Knight, Chairman of the Professional and Public Relations Committee. Copies of the Directory may be obtained from the Secretary-Treasurer, Rosalyn R. Zeitlin, 200 Oak Knoll Terrace, Highland Park, Ill.

Aram Glorig, Director, Audiology and Speech Correction Center, Walter Reed Army Hospital, announces a two-day Workshop on the Retraining and Rehabilitation of the Aphasic Patient. The sessions will be held on September 24 and 25. Consultants will be Jon Eisenson, Joseph M. Wepman and staff members. Topics include neurological and physiological aspects, language and communication, psychological and social effects, physical and occupational therapy and examining techniques. Persons interested in attending the sessions are invited to write to Dr. Reuben S. Horlick, Chief Clinical Psychologist, or to Mrs. Lois B. Senft, Supervisor, Speech Pathology, Audiology and Speech Correction Center, WRAMC, Washington 12, D. C.

Meetings Announced

American Speech and Hearing Association, November 23-25, Hotel New Yorker, New York City.

Speech Association of America, week of December 26, Hotel Statler, New York City.

California Speech Therapy Association, October 10, Stanford University Campus.

Acoustical Society of America, Fall meeting, October 15-17, Cleveland.

New England Speech Assocation, November 27-28, Boston.

Speech Association of the Eastern States, April 8-10, 1954, Penn-Sheraton Hotel, Philadelphia; March 31-April 2, 1955, Hotel Statler, New York City.

New Materials

The Speech Association of the Eastern States has begun publication of a new magazine, *Today's Speech*. The first issue was for April 1953. Plans eventually call for four issues annually. Further information may be obtained from Milton J. Wiksell, Division of Language and Literature, Shepherd College, Shepherd's Town, W. Va.

The June issue of *The Crippled Child*, publication of the National Society for Crippled Children and Adults, has established a new editorial policy. The magazine now will be directed specifically to the parents of handicapped children and will be developed to provide both general and special educational features for problems of management and home cooperation in therapy.

The Winnetka Readability Chart, which has not been available for some time, has been reissued by the Reading Clinic of the Department of Psychology, Temple University. This chart gives a formula for determining the grade placement of children's books.

The International Society for the Welfare of Cripples (127 E. 57th St., New York City) has announced the establishment of the Irving Geist International Film Library. The library will make available to groups all over the world films concerned with rehabilitation. Information may be secured from the society. Affiliated organizations and members of its United States Committee may borrow films without charge.

The Battelle Memorial Institute has established a new technological institute information service for the preparation of bibliographies and quoting and classification systems. Where required, the institute will undertake the development of information processing equipment. The service is the out-growth of Battelle's specific literature searching problems.

The International Audio-Technical Center, Sanremo, C. P. 207, Italy has issued a report of decisions of the first International Congress of Audio-Techniques. These recommendations and other reports on the congress may be obtained from the center.

The International Council of Scientific Unions have set up an abstracting board for the purpose of facilitating the work of existing well-established journals publishing abstracts of original papers in the field of natural sciences. Offices are at the Institute D'Optique, 3 Boulevard Pasteur, Paris 15, where work has already begun.

A copy of the proceedings of the annual spring conference of the Child Research Clinic of the Wood's Schools of Langhorn, Pennsylvania on 'The Exceptional Child in the Pre-adolescent Years' is available on request from the Wood's Schools.

A report on the Institute on Voice Pathology and the first International Meeting on Laryngectomized persons is available from the Cleveland Hearing and Speech Center.

A new pamphlet, *Child with a Cleft Palate*, is available from the Superintendent of Documents, Washington, D. C. for 10¢. It deals with the ways of treating a cleft palate, the special problems involved and problems when the child starts to talk. The catalog number for this publication is FS3.210:37.

Graduate Assistantships, Fellowships and Scholarships

This section, an annual feature of the December issue, lists part-time graduate appointments, fellowships, and scholarships specifically designated for graduate work in speech and hearing. General university fellowships and scholarships, unspecified as to area of concentration, and full time graduate positions will not be included. Only those announcements received too late for the December issue are printed in other issues.

Copy should be submitted to the News and Announcements Editor, and should include formal title of appointment, institution, and unit; dates, general duties, and remuneration; name and address of persons receiving applications. Deadline for receiving copy is 20 December, 20 March, 20 June, or 20 September.

Clinical and Research Assistantships. University of Minnesota. Audiological Laboratory, University Hospital. Starting January, July or September. Half time; 20 hours per week in clinical audiology. $1310 for eleven months; no remission of tuition. Students expected to enroll for one-half graduate load. Address Frank M. Lassman, Division of Otolaryngology, E 537 University Hospital, University of Minnesota, Minneapolis, Minnesota.

Clinical Assistantships. Temple University. Speech Clinic. Appointment on half time basis for period of two years. Stipend of $900 for academic year plus tuition. Address Gordon F. Hostettler, Department of Speech and Dramatic Arts, Temple University, Philadelphia, Pennsylvania.

News About People

Helen Berry was presented the Clara B. Stoddard annual award for a Wayne University student doing outstanding work in the School of Speech Correction for the year 1952-53.

McKenzie W. Buck has joined the staff of the Florida Center of Clinical Services and the Speech Department of the University of Florida as Assistant Professor of Speech and Head of the Speech and Hearing Clinic.

Aram Glorig has been named consultant in the State-Federal program in the rehabilitation program for disabled civilians, in addition to his present position as Director of the Audiology and Speech Correction Center of Walter Reed General Hospital in Washington, D. C.

Mark H. Larson, 117-A Pioneer Village, Denver 10, has duplicate copies of the *Journal* for all issues of 1938, March and June of 1945, and June and December of 1950, which he would like to trade for 1940 and 1941 issues.

Eleanor Cohen Treuhauft has been appointed speech therapist at Queens United Cerebral Palsy Center, Queens, New York.

Bernard Schlanger has accepted an appointment as speech pathologist at the Training School at Vineland, New Jersey.

NOTICES TO MEMBERS

Placement Registry Service

The American Speech and Hearing Association has established a Placement Registry Service for its Members and potential employers. Two lists will be maintained:

1. *ASHA members who register for employment.* Names will be listed alphabetically under headings indicating general type of employment desired. This list will be mailed upon request to persons, institutions and agencies seeking services of ASHA Members. It will include the following information:

a. Names and addresses of Members desiring employment or a change in employment *who request such listing.*

b. Information listed for each Member in the ASHA Directory.

2. *Individuals, institutions, and agencies desiring to employ ASHA Members.* These will be listed geographically. This list of potential employers will be mailed to all ASHA Members registered in the Placement Service. It will include the following information:

a. Names and addresses of individuals, institutions, and agencies *who authorize publication of vacancies.*

b. Type of position and requirements.

The responsibility of the Placement Registry Service is limited to supplying the information specified above. Further exchange of information such as salary, duties, transcripts, and references, will be carried on directly between employer and employee.

Listings of Members and potential employers will be revised monthly. To facilitate the revision of the listings, Members and employers are requested to notify the Placement Service as soon as positions have been filled.

All listings are free of charge.

The Placement Service is limited to paid up Members of ASHA and is not provided for Associates of the Association.

Applicants for registration should specify type of employment desired. All requests for registration should be addressed to: Placement Registry Service, American Speech and Hearing Association, Wayne University Speech and Hearing Clinic, Detroit, Michigan.

Progress Report of The Committee On Clinical Certification

During the period between January 1, 1952 and June 15, 1953 the Committee received 645 applications for clinical certification. Of these, 210 have been completely processed, 106 are circulating among the Committee members, and 229 are being held for additional information. The remaining applications have been processed by the Committee but have not yet been summarized by the Chairman or have not yet been reviewed by the Chairman preparatory to sending them to the Committee members. A few have

either withdrawn their applications or have been found eligible for automatic certification.

There are several reasons for the long delays in processing these applications:

1. Because of the moratorium on certification, no applications were processed during 1951.
2. Because the Committee had to develop forms and procedures, no applications were processed during the first part of 1952.
3. Of the 645 applications received, 515 were incomplete when first reviewed by the Chairman and could not be processed until the applicants submitted additional information or credentials.
4. The Committee members have full time positions and, hence, could devote only part time to this assignment.

The Committee has continued to be concerned about these delays and has taken several steps to expedite the processing of applications. Additional personnel has been employed in the Chairman's office and recently Ruth Beckey Irwin and Leo G. Doerfler spent some time at State College assisting the Chairman summarize the Committees' evaluations. Even with this assistance, however, it has not been possible to give adequate attention to the applications filed under the grandfather clause and those being filed under the new standards. To enable us to give more satisfactory service to all applicants, the Committee recently requested the Executive Council to establish an ad hoc sub-committee to handle the remaining grandfather applications. This Committee, consisting of Martin F. Palmer, M. D. Steer, Claude E. Kantner, and Leo G. Doerfler, Chairman, is now working on these applications.

Some delays have resulted because materials have not reached this office. From the time of its organization, this Committee has used office procedures which minimize the losing of materials through misfiling, etc. We have found that materials intended for this Committee have gone to the Secretary-Treasurer, transcripts have gone to the Pennsylvania State College Admissions Office, improperly addressed letters have gone to other campus offices, etc. To the best of our knowledge, we have answered all inquiries except those for which we need decisions from the Committees on Certification or Standards. If any member has written to this office and has not yet received a reply, the chances are that we have not received his letter, or that for some other reason it has not come to the attention of the Committee Chairman. We urge all these persons to write again, being careful to address their communication to Eugene T. McDonald, Chairman of the Committee on Clinical Certification, The Speech and Hearing Clinic, The Pennsylvania State College, State College, Pennsylvania.